The Electrical Industry's Weekly Magazine

May 6, 1957

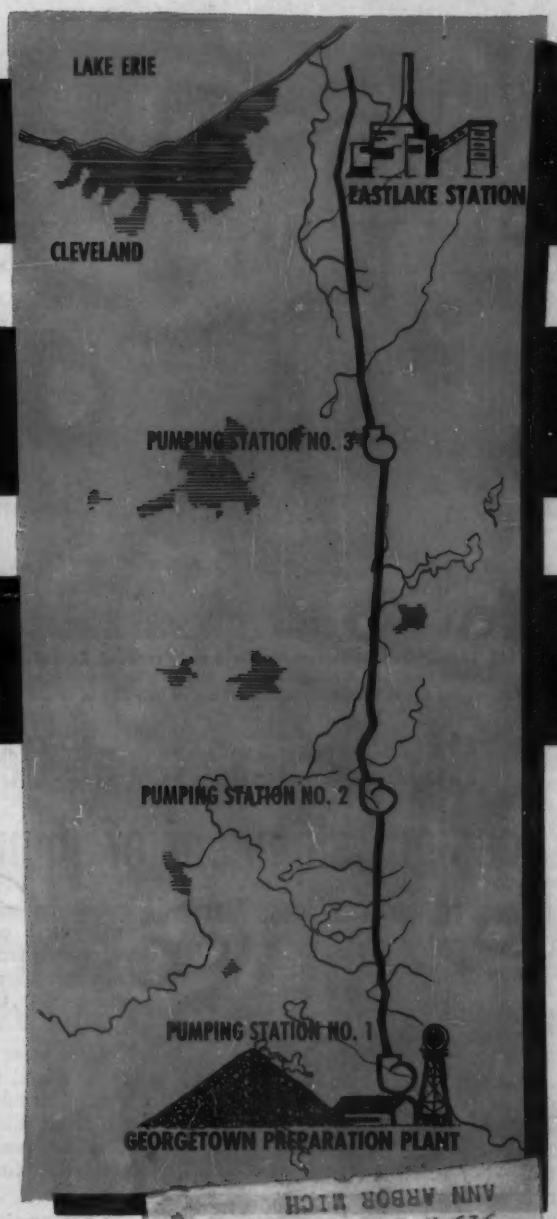
Electrical World

Price 50 Cents

A McGraw-Hill Publication

Piping Coal to Cleveland Promises Economy

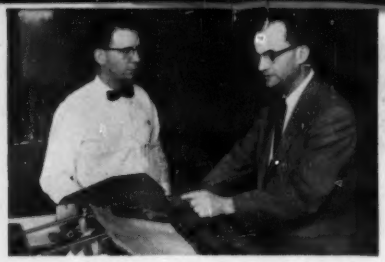
...Page 55



E B POWER
UNIVERSITY MICROFILMS I
313 N 1 ST
ANN ARBOR MICH

Utilities shoot for Safety Breakthrough . . . P 50

POWER TRANSFORMER design time is greatly reduced. Example: certain reactance characteristics—formerly requiring 60 engineering man-hours to figure—are now computed in 57 seconds. L. Wetherill and P. A. Abetti check calculations of IBM 705 at G.E.'s Power Transformer Department.



BOILER FEED PUMP MOTOR electrical characteristics are computed in 5 minutes. This time-saving not only speeds but also improves motor design. W. J. Martiny, Jr. and D. H. Ware discuss operation of IBM 650 at General Electric's Medium A-C Motor and Generator Dept.

HYDRO-GENERATORS give optimum performance because use of computer allows time to consider many more designs than possible with old calculating methods. Mary Parillo and L. Wuosmaa complete generator design at Large Motor and Generator Dept.

STEAM TURBINE-GENERATOR design problems, some previously unsolvable, are solved at G.E.'s Large Steam Turbine-Generator Engineering Calculations Center. H. N. Cantrell, A. W. Rankin, and Ruth E. Callaghan examine results of turbine bucket design study.

How computers at General Electric help speed design, shipment of improved apparatus for utilities

Newest computer achieves faster design of power transformers

A new IBM 705 electronic computer, capable of producing design calculations up to 3800 times faster than hand methods, is now operating at General Electric's Power Transformer Department, Pittsfield, Mass. It is the latest example of General Electric's use of computers not only to free valuable engineering personnel from routine calculating, but also to help improve design and hasten shipment of apparatus for the electric utility industry.

Since this newest computer greatly reduces design time, and helps eliminate possible errors, improved transformers can be shipped faster. Also, utilities receive construction information sooner after submitting specifications, thus eliminating possible delays in building foundations.

Using earlier calculating methods, engineers had time to consider only a limited number of alternative designs. Now, all practical designs can be weighed, and the result is a transformer of optimum design for each application.

By performing in minutes calculations formerly requiring weeks, the computer reduces engineering expenses. This helps combat inflationary pressures that increase the cost of transformers. And General Electric engineers, freed from time-consuming calculations, have more time for creative thinking and product improvements.

The Power Transformer Department's machine is the newest of General Electric's growing number of computers used to hasten refinements in the Company's full range of apparatus to help utilities meet growing load. General Electric Company, Schenectady 5, N. Y. 301-356

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 147, No. 18 MAY 6, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

DISTRIBUTION

Manufacturer-Utility Reciprocity Essential

Former should supply cooler electrical characteristics; latter should set up reasonable starting-current rules.....p 58

Ally to Combat Transformer Corrosion

Manufacturers, utilities attack problem, respectively, through tank surface design, better vault conditions.....p 64

GENERATION

Coal Pipeline Promises Economy

First in U. S. will carry 1.25 million tons of coal per year to the 660-Mw Eastlake power plant.....p 55

SAFETY

Utilities Gun For Safety Breakthrough

After poor post-war showing, they are now within shooting distance of all-industry safety averages.....p 50

TRANSMISSION

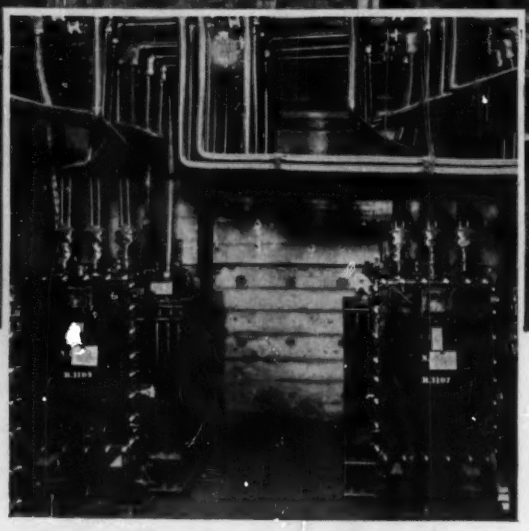
Field Loadings Check H-Frame Settings

Test-pile loadings determine resistance of timber piles to uplift, download, and lateral loads.....p 62

Departments

Atomic Progress 48
Books 98
Catalogs and Bulletins..... 96
Editorials 43
• Electrical Newsletter 19
Engineering Reference Sheet.... 74
From the Publisher..... 5
How To 67
• Management Newsletter 107
Manufacturers and Markets.....102
Meetings Calendar 120
Meeting Reports 46
New Equipment 87
News About People.....116
News-Beat 49
Readers Forum 122
Selling 76
Washington Wire 44

INDEX TO ADVERTISERS.....125



This underground network vault with its array of cables is typical of the up-to-date installations demanded by Pacific Gas and Electric Company in order to render maximum continuity of service to their customers.

Dependable service below pays off above

Pacific Gas and Electric Company's recent installation of nearly seven miles of Keystone butyl-insulated duct cable is just one part of its continuing network expansion to insure dependable power for San Francisco's ever-increasing loads.

Meeting the rigid RO & N specifications set up by Pacific Gas and Electric Company engineers, Keystone butyl-insulated cables offer extra value in their high dielectric strength, moisture resistance, resistance to ozone and corona cutting, and in their ability to take sharp bends and withstand high conductor temperatures. Insulation and sheath are vulcanized together in a construction that withstands the moisture and heat in duct systems and allows simple, damage-free pulling.

Backed by Okonite research and quality control, Keystone butyl-insulated cables offer these service-lengthening features without any increase in cost.

Keystone is one of the family of Okonite insulations: Okolite and Okonex (strip-insulated types), Keystone and Watertite (extruded types). Bulletins are available on each from The Okonite Company, Passaic, N. J.

4188

where there's electrical power . . . there's **OKONITE CABLE**

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. . . from the pub

Big thinking. Big ideas. Big plans. Big money. Big results.

That seems to be the pattern of utility thinking these days. But there are still the little, the work-a-day problems of producing and getting power out to the customer. A lot of it may seem "nuts and bolts" stuff. But it's still this "nuts and bolts" stuff that takes a big chunk of utility manpower and money. And it's here that lie fat opportunities for economy.

Here's where Electrical World's weekly "How To" pages come in. They're loaded with time and money-saving shortcuts. Recent examples:

- Using blasts of corn cob dust to clean generator windings. One utility which did cut man-days from 40 to 15, cut cost from $875 to $375.

- Moving pole-top regulator control cabinets from up high on a pole to 10 feet above ground level. It slashed manhours for maintenance in half.

- Putting ordinary paper bags on bushings instead of masking paint when painting transformers. This trick lowered costs 75%.

Whether you serve 100 or one million meters, they're ideas you can use—and use now. For this week's "How To" features turn to page 67.

Fischer Black

ELECTRICAL WORLD

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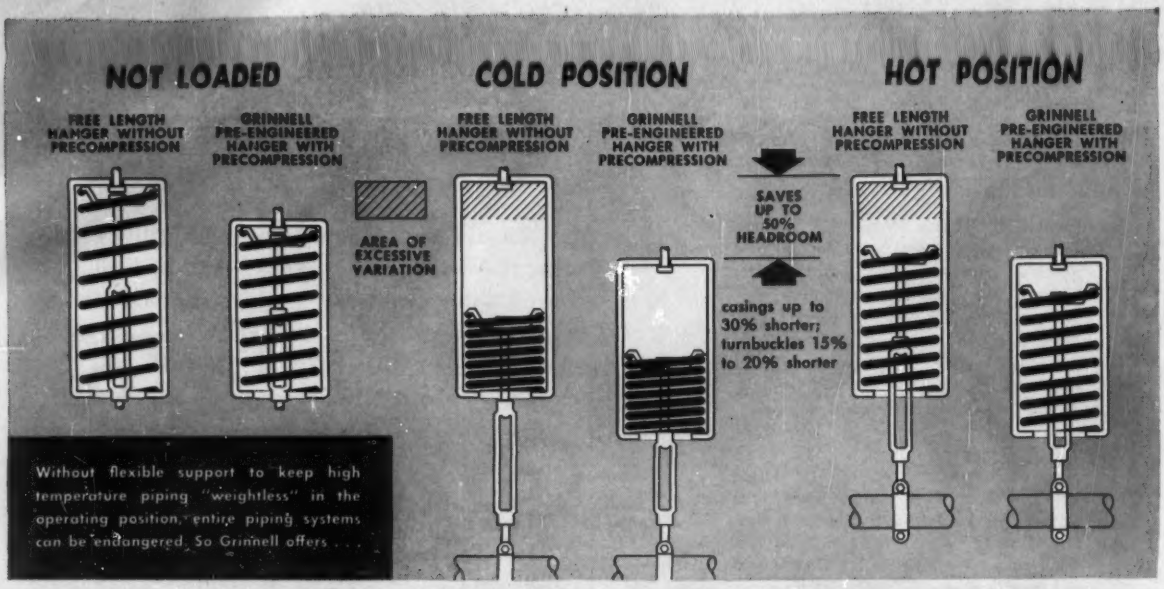

NOT LOADED
COLD POSITION
HOT POSITION
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION
AREA OF EXCESSIVE VARIATION
SAVES UP TO 50% HEADROOM
casings up to 30% shorter; turnbuckles 15% to 20% shorter
Without flexible support to keep high temperature piping "weightless" in the operating position, entire piping systems can be endangered. So Grinnell offers . . .

Precompressed Hangers for Safer Support of Piping

Helical coil springs are widely used in hangers for flexible support of piping which moves up or down during thermal expansion. The A.S.A. code for pressure piping requires that variable spring hangers support at least a minimum of 75% of the pipe's weight for a pipe that rises (relaxing the spring) and no more than 125% of the pipe's weight for a pipe that lowers (compressing the spring) during operation.

Precompression patented Grinnell principle

To guard against the spring's supporting force exceeding the limits of variation, Grinnell developed and patented a variable spring hanger design. The steel casing holds the spring permanently precompressed, at the threshold of the hanger's working load range. This prevents the spring decompressing into its area of excessive variation.

Pre-set is not a substitute

As a partial substitute for this patented precompression, some manufacturers insert a spacer between the top end of a free-length hanger casing and the spring to hold the spring's height temporarily within the working range during shipment and erection.

Another device requires the manufacturer to drill symmetrically opposite holes in the casing walls and insert a bolt to hold the spring's height within the working range. When these devices are removed from the hanger and discarded, the spring can decompress, resulting in high variability in supporting force.

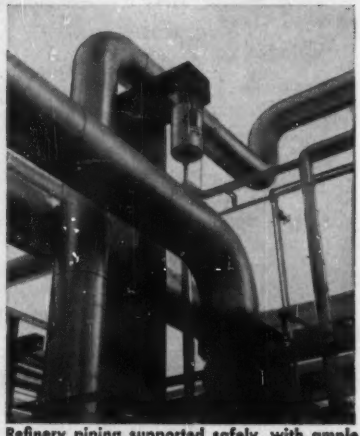
Cold-setting a universal factory service

For the erection crew to avoid having to compress the spring down to the erected position, the manufacturer can compress the spring down to this height. Grinnell can provide a cold-set bolt in precompressed hangers.

Less headroom required by Grinnell Hangers

Shorter hanger casings made possible by Grinnell's patented precompression, reduce bulk shipping weight and required headroom by eliminating undesirable height. Installation is simplified by this shorter casing and also by an integral load scale with load indicator.

Additional headroom is saved by a correspondingly shorter turnbuckle. These precompression advantages are available in short spring and double spring models as well as standard spring models.



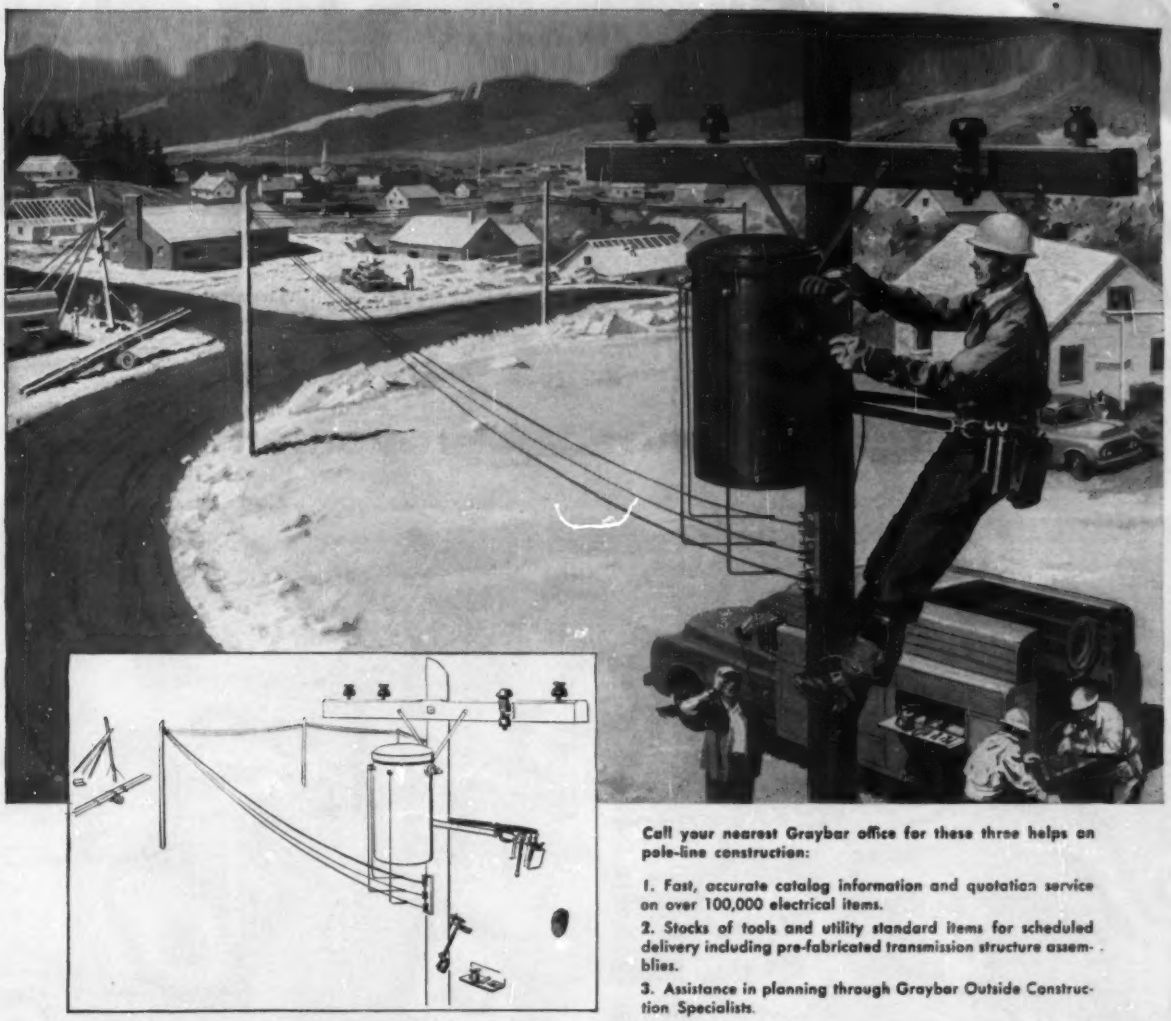
Refinery piping supported safely, with ample flexibility but low headroom.

Available in 63 standard units

Grinnell Variable Spring Hangers are available in 21 sizes each of short, standard and double spring models . . . for maximum travel of 1¼, 2½ and 5 inches respectively within working load ranges. Load capacities extend from 43 lbs to 30,550 lbs. The maximum variation in the standard size per ½-inch deflection is 10½% of rated capacity; inversely proportional in short spring and double spring models.

For further information

If you have a pipe suspension problem, you are invited to write: — Grinnell Company, Inc., 252 West Exchange Street, Providence, R. I.



Call your nearest Graybar office for these three helps on pole-line construction:

1. Fast, accurate catalog information and quotation service on over 100,000 electrical items.
2. Stocks of tools and utility standard items for scheduled delivery including pre-fabricated transmission structure assemblies.
3. Assistance in planning through Graybar Outside Construction Specialists.

When home building means line building

Put Graybar on your construction staff

As residential areas spread outward from towns and cities and your load demands build up, call on Graybar for maximum help. A telephone call to your nearest Graybar warehouse or office puts our staff to work for you. Whether you're building new lines, adding more feeders or increasing feeder size, Graybar can supply the materials, equipment and supplies you'll need. In emergencies, or for regularly-scheduled shipments, count on prompt deliveries of anything and everything you need for pole-line maintenance and construction . . . via Graybar. 712-93

CALL **GraybaR** FIRST FOR

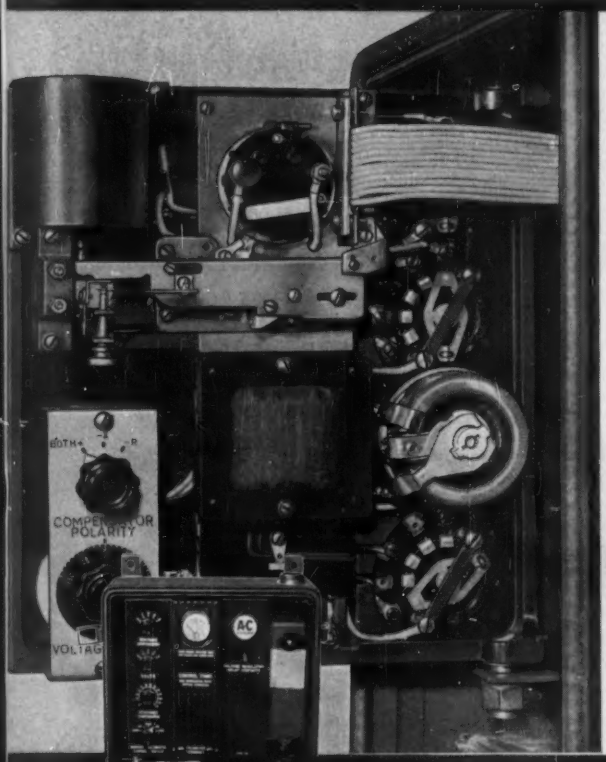
"GRAYBAR" Everything Electrical "GraybaR" ELECTRIC COMPANY

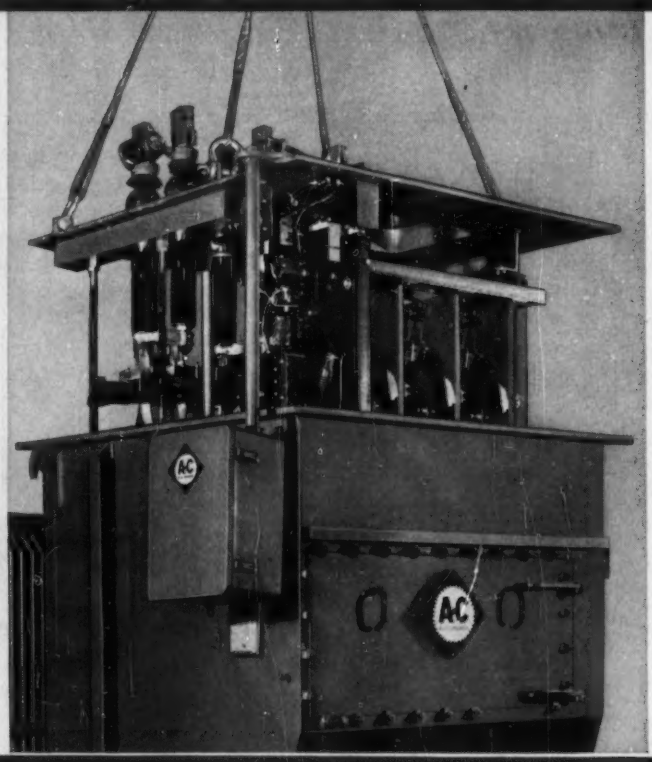
GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

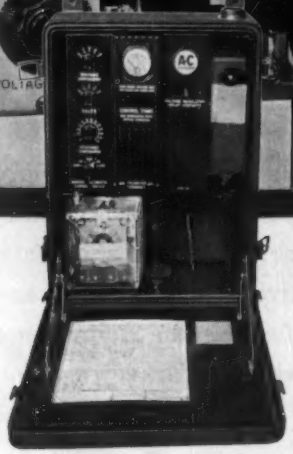
Allis-Chalmers three-phase

Always a step

Continual engineering development and laboratory testing produce constant regulator improvements.







New control panel

Handy control diagram on inside of panel cover . . . nickel-plated parts . . . stabilizing coil on solenoid of voltage-regulating relay . . . readily accessible contacts on voltage-regulating relay . . . rustproof plastic coating on open edges of control cabinet . . . and many other features.

New gear motor

Acceptance tests for gear motors include breakdown testing in hot transformer oil. Motors are driven against a mechanical stop and must survive at least 40,000 operations (equivalent to 5 million tap changes).

Vari-Amp is an Allis-Chalmers trademark.

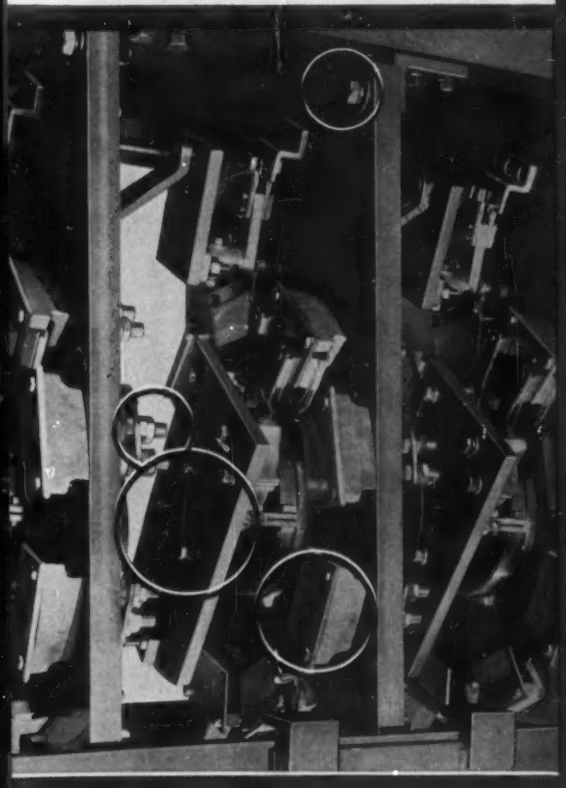
In addition to all these improvements, unit construction, *Vari-Amp* and all the other original features make this the leading regulator. For complete details, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS CHALMERS

A-5392

station step regulators

ahead



New reliability

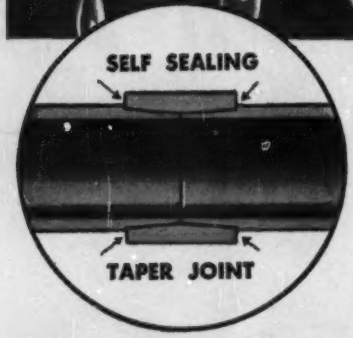
Locking devices are engineered to meet requirements of long life. Shown are locking strips, double nuts, prick-punched lock nuts and lock washers, as well as wired bolt heads.

New painting techiques... hinged door...skid mounts

1. **Better finish** results from continuing study . . . adds service life under any atmospheric condition.
2. **Inspection door** has reusable synthetic gasketing that fits into a groove . . . permits tightening down metal-to-metal contact.
3. **Skid mounts** permit easier movement of regulator in either direction . . . add strength and rigidity.

ALLIS-CHALMERS

WATERTIGHT!



Orangeburg Fibre Conduit Prolongs Cable Life

Keep out corrosive ground waters, and you prolong the life of underground cables, say utility engineers!

Why? Because ground waters containing corrosive elements derived from the soil and concrete encasement attack cable sheath and shorten cable life. Orangeburg's impermeable wall and self-sealing Taper-Sleeve Joint shed them *"like water off a duck's back."* You get maximum protection with Orangeburg.

Orangeburg protects cables in many other ways. Smooth bore, low co-efficient of friction reduce incidence of abrasion. Its material is strong, tough, resilient, durable.

No other conduit is easier to install

Light, 8-foot lengths and a complete line of bends and fittings speed installation. Taper-Sleeve Joints tap water-tight in a jiffy. Orangeburg lays faster and at lower cost than any other type of conduit.

Orangeburg Fibre Conduit has prolonged cable life at minimum expense for utilities, municipalities and industry since 1893.

Distributed by Graybar Electric Company and by General Electric Supply Company. Branches and stocks in principal cities.

WRITE DEPT. EW-57 FOR CAT. 52

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®

FIBRE CONDUIT

Your Westinghouse representative can prove...

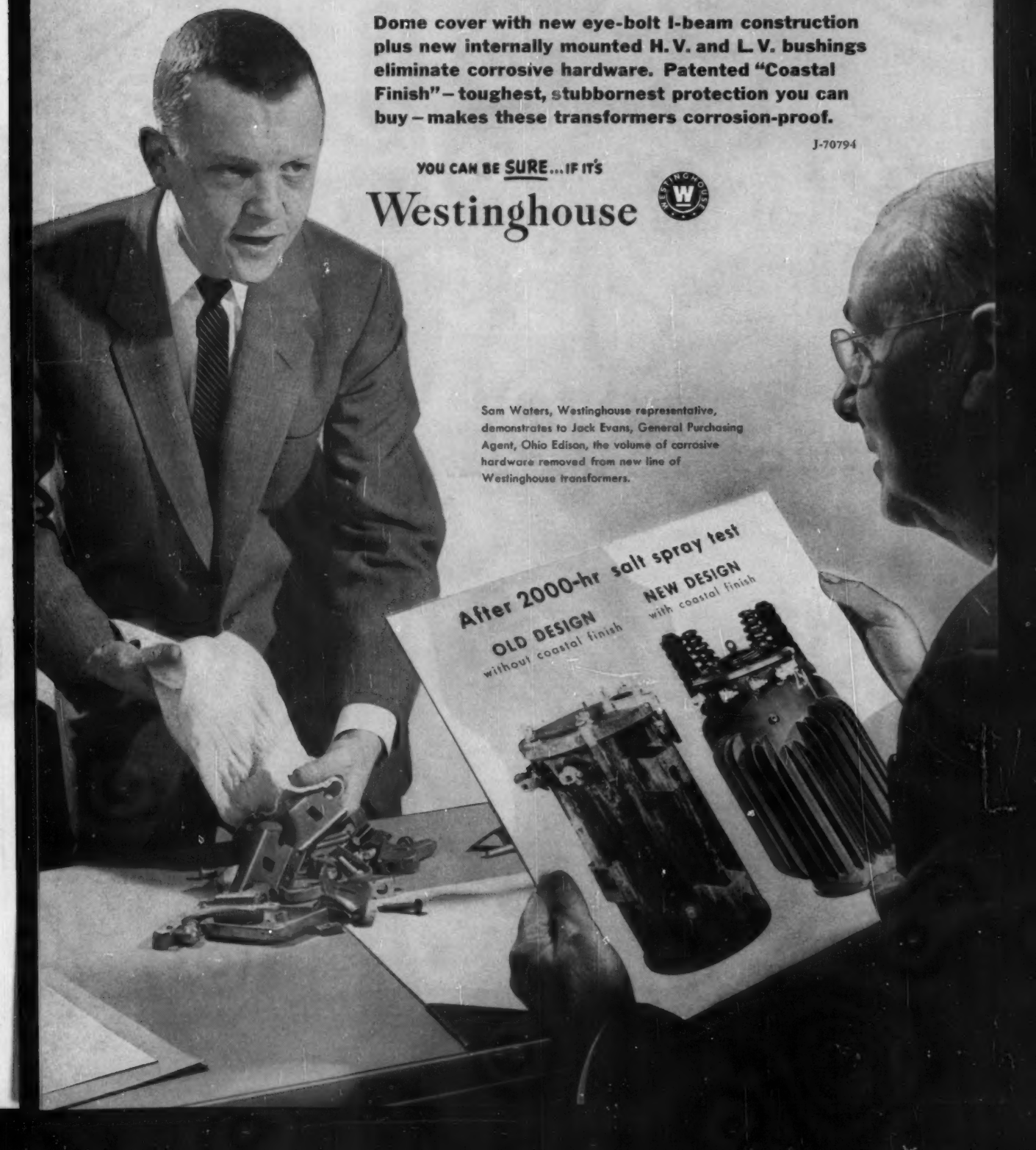
NEW TRANSFORMER DESIGN ELIMINATES 18 SOURCES OF CORROSION

Dome cover with new eye-bolt I-beam construction plus new internally mounted H. V. and L. V. bushings eliminate corrosive hardware. Patented "Coastal Finish" – toughest, stubbornest protection you can buy – makes these transformers corrosion-proof.

J-70794

YOU CAN BE SURE... IF IT'S

Westinghouse



Sam Waters, Westinghouse representative, demonstrates to Jack Evans, General Purchasing Agent, Ohio Edison, the volume of corrosive hardware removed from new line of Westinghouse transformers.

New residential subdivision gets

Three 600v Durasheath Cables were pulled in ducts throughout development.

underground distribution system

Electric service is provided by 141,000 feet of Anaconda Durasheath Cable

For one of the South's largest new developments, an entire underground distribution system was installed recently.

The cables: 106,000 feet of Anaconda's 4/0, 1/C 600v Durasheath* neoprene-jacketed cable with Anaconda Type ANW network insulation, and 35,000 feet of #2, 1/C 15kv grounded neutral Durasheath with Type AB butyl insulation.

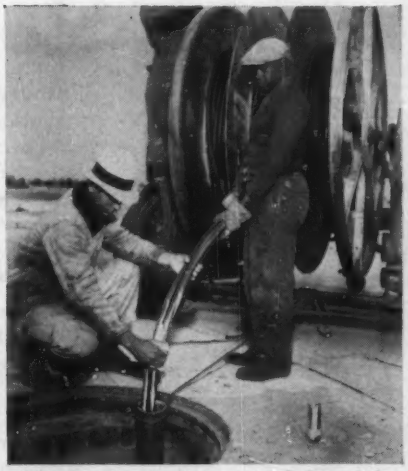
A good choice! Anaconda's special network and high-voltage butyl insulations give you top moisture and heat resistance, excellent overload protection. Type AB butyl insulation, too, has *inherent* resistance to ozone.

Available in all sizes, single and multiple conductor, copper and aluminum, from 600 to 15,000 volts. Want more information? See the Man from Anaconda or your Anaconda distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. 67360

SEE THE MAN FROM **ANACONDA®**
FOR **DURASHEATH CABLE**

Each reel on special electric-powered rig held 400 feet of Durasheath.



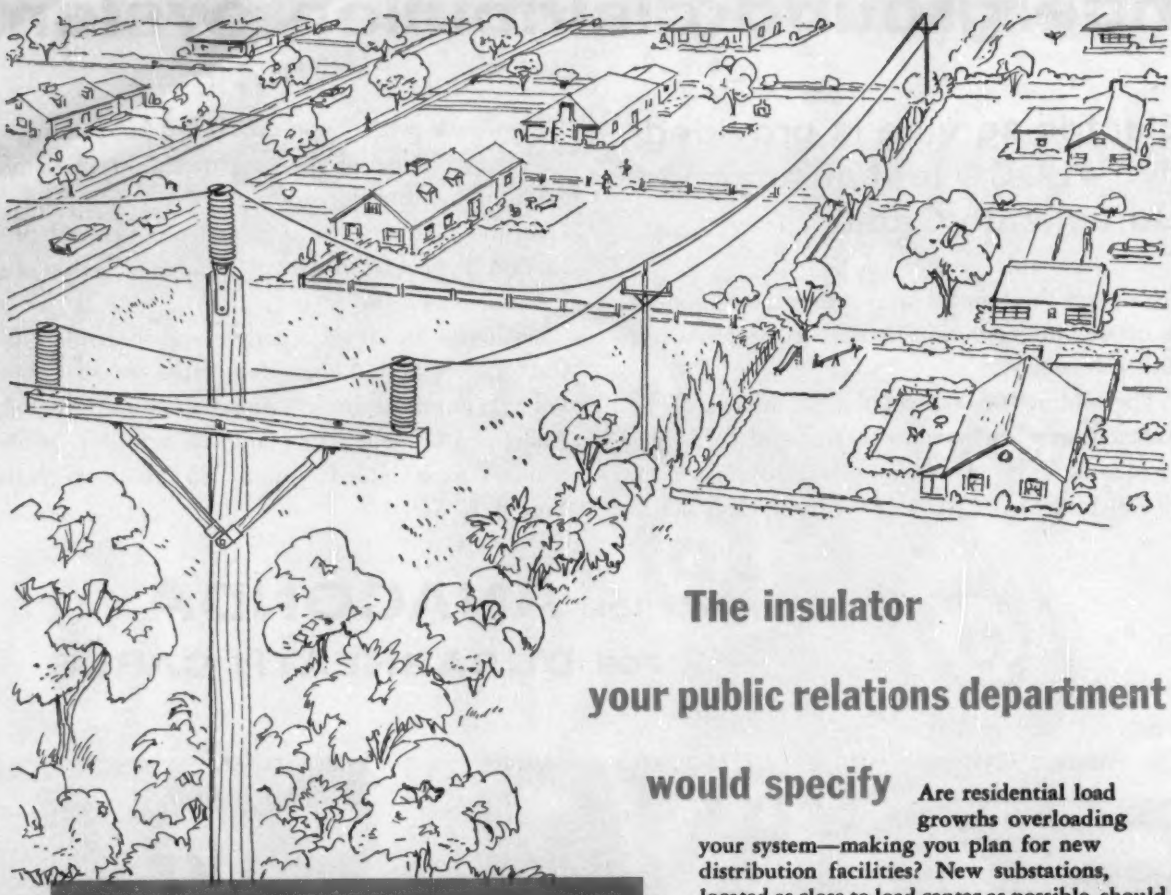
600v Durasheath shown trained through last manhole to side of transformer vault.

15kv Durasheath was likewise pulled into transformer house through duct.

In underground vault of substation, cable was trained to the wall.

In transformer house, 600v Durasheath was terminated at transformer secondaries.

In same location, 15kv Durasheath is shown being terminated at transformer bushings.



The insulator your public relations department would specify

Are residential load growths overloading your system—making you plan for new distribution facilities? New substations, located as close to load center as possible, should be your best solution—if sites are available . . . and *if* a subtransmission line through a residential area doesn't encounter customer objection. If you build such a line on large imposing structures, it probably will!

There's a wonderful way to do it, however, and one which will retain customer goodwill! A line up to 69 Kv, and even higher voltages, can go on "small" unobtrusive wood-pole structures, with single cross-arms—and compact, sturdy good-looking Lapp Line Posts. In addition to sparing customer feelings, you'll be saving money, too, in initial cost, and maintenance; service records from coast-to-coast show that such lines for subtransmission voltages are more reliable and trouble-free than any others. And particularly important for lines in residential areas is the fact that Lapp Line Posts are inherently free of RIV and TV interference at rated voltages.

Once you've installed such a line, your future problems diminish. A trim, good-looking, high performance line on Lapp Line Posts serves as a beautiful example of a complaint-free installation. It will be easier to get right-of-way for *future* transmission lines.

Lapp Line Posts, either with tie-wire head or clamp-top, are available in voltage ratings through 88 Kv.

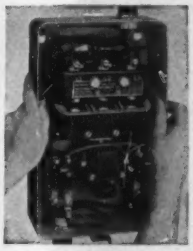
Lapp Insulator Co., Inc., Le Roy, N. Y.

CLARK Type "CY" Starters need less maintenance ...when they do, it takes less time!

All parts in Clark Type "CY" AC magnetic starters are designed for dependable, heavy-duty, long-life operation. The exclusive "CY" principle of arc quenching—using strong multi-turn magnetic blowouts and double-break contacts—substantially lengthens contact life by minimizing arcing effects. Hundreds of thousands of Type "CY" starters in actual service have proved that these features mean less frequent maintenance.

When service or alteration is required either because of wear or change of application, Clark Type "CY" design makes the work easier and much faster. All parts are readily accessible from the front—screw-driver and wrench are the only tools needed. Service kits are available for all replacements. Times shown below include all operations, starting with a wired unit in a cabinet. The starter illustrated is Size 2, but servicing other sizes is correspondingly simple.

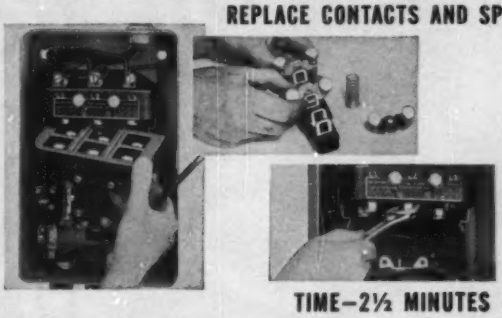
INSPECT CONTACTS AND SPRINGS



Simply open snap-action clips to release lower arc shield, exposing all contact surfaces to view. Replace arc shield after inspection. No tools required. Contact springs are in view at all times.

TIME—10 SECONDS

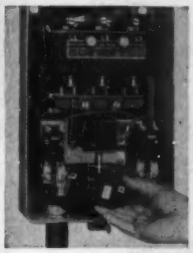
REPLACE CONTACTS AND SPRINGS



Loosen two captive screws holding movable contact arm in place. Release lower arc shield by opening snap-action clips. Remove contact arm and lower arc shield together. Movable contacts are removed by a simple twist to depress springs. Remove springs. Stationary contacts are loosened with a wrench. Reverse operations for installing new springs and contacts.

TIME—2½ MINUTES

REPLACE COIL



Remove snap-in pin to release armature. Remove coil connections. Remove coil clamps held by two captive screws. Coil drops free. Reverse operation for replacement.

TIME—2 MINUTES

REPLACE MAGNET ASSEMBLY

Remove contact arm. Remove armature and coil. Take out 4 holding screws and lift out magnet. Reverse operation for installing new magnet assembly.

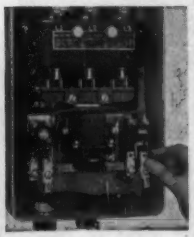
TIME—4½ MINUTES

ADD CONTROL CIRCUIT CONTACT

Remove main contact arm. Attach new control circuit block with stationary contacts to base plate (one screw). Mount movable control circuit contact and spring on main contact arm (one screw). Reassemble.

TIME (Exclusive of Wiring)—1½ MINUTES

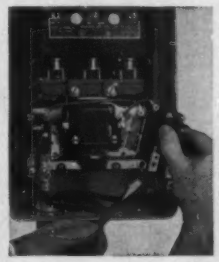
CHANGE OVERLOAD HEATER COILS



Remove overload relay cover plate held by one captive screw. Remove 2 connection screws and take out heater coil. Reverse operation for installing new coil.

TIME—2½ MINUTES
(Total for replacing both coils)

REPLACE OVERLOAD RELAY



Disconnect wiring and take out 2 screws holding relay mounting bracket to base plate. Remove old relay from mounting bracket. Reverse operation for replacement.

TIME—4 MINUTES

REMOVE STARTER FROM CABINET

Disconnect external wiring. Loosen or remove 3 screws holding starter to base plate (Note: on size 2 and smaller, all screw holes are slotted and screws need only be loosened). Lift starter from cabinet.

TIME—1½ MINUTES

Clark Type "CY" AC Magnetic Starters are now available in sizes 0 through 4.
For complete information contact your nearest Clark distributor or sales office, or write us direct.

The **CLARK** **CONTROLLER** *Company*

Everything Under Control

1146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA: CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO

"Each and every component good as new ... after four years' continuous service,"

reports Pennsylvania Electric Company

Experiences like this back up 20-year contact-life warranty on URS regulators

"When we opened this Westinghouse URS voltage regulator after four years' continuous service, we found each and every component as good as new," states the maintenance foreman at Pennsylvania Electric's Sayre-Waverly Substation. "Contacts still in perfect operating condition.

"With as many as 100 operations per day," he continues, "this equipment delivered continuous trouble-free service. The Westinghouse URS regulator eliminated the constant adjustments, necessary to prevent drifting, which were required for the regulators we formerly used. Maintenance is extremely low."

He adds, "Complete dependability under constant service, long, trouble-free life, ease of adjustment, and stability in delivering constant voltage make the URS regulator a major factor in guaranteeing customer satisfaction.

"The 'inside story' revealed when we inspected the unit, gives us complete confidence that this regulator will perform its exacting job . . . for a long time to come."

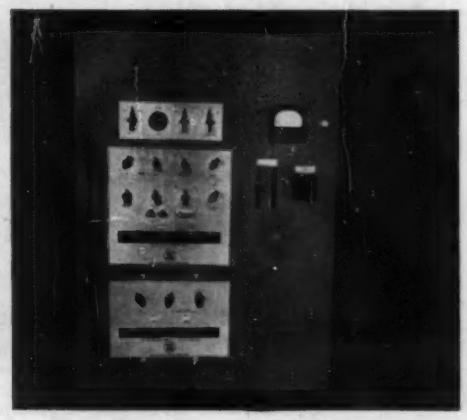
And now . . . a new concept in precise voltage regulation . . . the URS regulator is equipped with Magamp® (magnetic amplifier) control. Standard for URS and URT load tap-changing equipment for both station step regulators and power transformers. Magamp has no moving parts, no need for mechanical adjustments, no maintenance. All settings—band width, balance voltage, line-drop compensation—are made electrically. This is one of the features assuring still longer life of URS regulators, better voltage regulation.

For all the facts concerning URS voltage regulators, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70807

"After four years' service—and more than double the operations of a normal between-inspections period—every component was like new in this Westinghouse URS regulator," states Mr. Frank Bartlett, Jr., maintenance foreman of Pennsylvania Electric Company.

YOU CAN BE SURE... IF IT'S Westinghouse

In this recent announcement, Westinghouse offers a 20-year prorated warranty on contact life for URS regulators with inspection of contacts extended to 10-year intervals.



Behind this control panel are the economy of maintenance-free Magamp and the unmatched speed and smoothness of Geneva gear tap changing—exclusive with URS and URT voltage regulators.

Now for "Preferred-Emergency" Switching

an Off-the-Shelf

AUTOMATIC TRANSFER PANEL

With *Any Desired* Throwover Scheme ...at the *Flip of a Switch!*

A Flip of the Switch Gives You:

- Choice of making either source preferred.
- Choice of automatic or manual (semi-automatic) return.
- Adjustable time delays —range up to 10 minutes.
- Optional manual operation of line switches.
- Choice of returning: in either open or closed transition (with or without paralleling).
- Optional lockout on bus faults.

Other Unique Features:

- Indicating lamps for switch positions, live sources, and lockout action.
- Alarm to prevent leaving panel set on "manual operation."
- Transparent cover over selector switches prevents unintended changes in settings.

Saves Time and Money

You don't have to design and build (or negotiate for) — your special automatic transfer panels in order to get the special specific throwover schemes you need. The new S&C Automatic Transfer Panel will give you any or all throwover options... selector switches give the scheme you want!

With this new stock panel you can eliminate the engineering and correspondence involved in getting custom-built panels.

Furthermore, you are sure of getting what you want today; tomorrow you can change your mind, and later you can revise the scheme—still using the same transfer panel. Imagine! You can order your panel ahead of time, before specifications are settled.

— Buy from our stock for your stock —

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

NEWS-SCOPE

FUTURE NEWS ▶ **Outdoor lighting will get big promotion boost in 1958.** Among other things, there is a plan for intensive campaign aimed at architects and lighting engineers to integrate outdoor lighting with building design.

Utility nuclear study teams are taking hard look at possible shifts to higher temperatures and high steam pressures for nuclear power plants. They would like to bring nuclear plants more in line with conditions of conventional plants.

Low-cost, centrifugal separator for fly ash will get tryout by a utility this summer. If it works, it will sift out the coarser, less desirable particles of the ash from the finer, saleable particles which are used as aggregate in cement mixes. This could give big boost to fly ash sales.

LATE NEWS ▶ **Utilities in Texas flood area report light damage to facilities.** Some transformers were damaged by lightning. Less than a dozen poles were down.

Utility Workers Union's 2,600 members strike at Cleveland Electric Illuminating after deadlock on wages and key issue job transfers and classifications. CEI officials hope to maintain all services to its 520,000 customers with aid of nonstriking supervisory personnel and clerks.

Labor dispute delays accessory piping work on generator unit at new Detroit Edison plant. Case is in hands of NLRB with settlement date uncertain.

Reclamation Commissioner W. A. Dexheimer firmly opposes construction of Nez Perce Dam on Snake River because it would block Salmon River to spawning fish. Nez Perce construction was proposed by FPC staff in preference to the proposed Mountain Sheep-Pleasant Valley project of Pacific Northwest Power Co.

Virginia Electric & Power gets okay from Virginia, North Carolina PSC's to use new selective sampling method for routine testing of single-phase meters. Under plan, results of annual tests on 1% sample will guide selection of types, makes, and ages of meters for concentrated testing.

At Southwest Electric Conference, EEI Managing Director Edwin Vennard said recent public opinion survey disclosed that rural co-op members are more strongly opposed to federal power preference than are company customers (Report on Southwest meeting begins on page 46).

H. K. Porter Co, Inc, purchases R. Thomas & Sons Co, effective May 6, for undisclosed amount of cash. Thomas, producers of insulators in Lisbon, Ohio, will be merged with Porter's Delta-Star Division.

General Electric will boost prices on switchgear protective relays by 8% effective May 6; on all distribution lightning arresters, cutouts, and fuse links by about 5% effective noon, May 13 (See p 107). Latter hike does not affect station and line type lightning arresters and oil-filled cutouts.

Congratulations . . . S. J. Pettersen is new president-general manager at Mississippi Valley Public Service succeeding E. H. Finkelnburg, now board chairman . . . Robert F. Scott is elected a vice president of Southwestern G&E . . . Louisville G&E ups B. H. Milner to VP and treasurer . . . Houston L&P's J. F. Estill, Jr, becomes a VP.

SAFETY ▶ **Utilities may be breaking through the "accident barrier" any day now.** Present trend toward safety consciousness will push the utility frequency curve below that for all industry **(pp 50-54).**

"Breakthrough" offers utilities these benefits: Cheaper insurance, high credits on experience ratings as a result of accident prevention programs. One insurance firm gave its utility clients a 25% dividend on '56 policies. These companies had a good frequency rate in 1956: Wisconsin Public Service, New Orleans Public Service, Alabama Power, Southwestern Public Service, Jersey Central Power & Light, Baltimore G&E, and Cincinnati G&E.

WASHINGTON ▶ **An Administration request for nationwide flood insurance** for utility, industry, business, and residential property is now being studied by a House appropriations subcommittee. If the solons approve, first policies ought to be in the hands of their buyers by July 1st . . . the beginning of fiscal '58. Other details: Federal Flood Indemnity Administration will run the show. Residential properties will be insured to $10,000; business, industrial and other properties to $¼ million. FFIA has come up with a rate range of $1 to $2.50 per hundred dollars per year **(p 44).**

GENERATION ▶ **Is there a coal pipeline in your company's future?** There may be if you are in a favorable location and you have sufficient demand at a single site. There's a short discourse on the future of coal pipelines as a part of our comprehensive article on the engineering philosophy behind the 108-mile line which will serve Cleveland Electric Illuminating's Eastlake plant. This is the first full scale use of a coal pipeline by an electric utility, and it turns out to be a Paul Bunyon-size job to move the 1½ million tons of coal each year. CEI figures there will be substantial transportation savings resulting from the use of the line when it goes into normal operation **(p 55).**

Better collector ring performance for hydro-generators will result from frequent reversal of ring polarity, an extensive survey by PG&E shows. This along with increased current densities on brush ends and use of electrographitic grade of brushes will cut maintenance and save money **(p 67).**

DISTRIBUTION ▶ **Step-by-step method for terminating shielded, 5-kv aerial cable** with either copper or aluminum conductor are shown in this week's Engineering Reference Sheet **(p 74).** Procedures are adopted from distribution standards of New England Electric System.

Here's an offer of cooperation from the air conditioning industry, along with some data on package units that you may have been searching for. P. W. Wyckoff, chief engineer, Airtemp, writes that air conditioning manufacturers should furnish utilities with the electrical characteristics of their equipment. In turn, he says, utilities should set up reasonable starting-current rules for these products. He also points up some of the foibles to watch when trying to figure starting or operating current from nameplate ratings. Further, writes Wyckoff, step starters are not the answer to distribution problems arising from air conditioning loads. With the hot weather just ahead, this could be profitable reading for you **(p 58).**

Reducing corrosion damage on vault transformers is a joint venture. Manufacturers may further simplify external surface designs of the tanks to facilitate application and adherence of protective paint. Utilities may provide better vault conditions and improve inspection and maintenance schedules. Right now there doesn't appear to be any economical short-cut. Plastic tanks or plastic covering may eventually provide a more corrosion-proof approach to

the problem, but that will be some time off. For tips on how to cut corrosion losses on the submersible type transformers on your system, you'll want to read the informative article—a joint venture, by the way—by a utility man and two manufacturing experts **(p 65).**

TRANSMISSION ▶ **What kind of piling do you need for transmission H-frames** on flood plains? Northern States Power uncovered some answers for a specific line by applying test loads to sample piling in the field. In this specific instance it found considerable resistance to uplift and download pressures. But when it came to lateral loads, there was variable displacement depending on content of soil strata. Method used may serve you for similar tests **(p 62).**

Pre-formed guy grips are being used by Wisconsin Electric Power for deadending all overhead ground wires and making up guys **(p 70).**

METERING ▶ **Shellacked plywood shield helps protect against electrical hazards** on meter sockets. It is a brainchild of Sheldon M. Lahr at Ohio Power **(p 70).**

SELLING ▶ **Good year ahead for appliance sales,** predicts Hotpoint President John C. Sharp. He bases this on outlook for rising personal incomes, marriage and birth rates. . . . Campaign opens to induce young men to get into selling **(p 76).**

MANAGEMENT ▶ **Industrial production curve will level out and be a straight line for the next few months.** This prediction will remain good even if steel, autos, and housing do not reverse their present trends. The continuing squeeze on corporate profits is putting the bite on electrical manufacturers to revise their prices upward. These increases, if they materialize, will be independent of any result of coming wage contract negotiations **(p 107).**

PEOPLE ▶ **Ottis T. Fitzwater is new prexy of Indianapolis Power & Light,** succeeding Harry T. Pritchard who continues as board chairman. Bernard W. Schotters moves into the executive vp slot; E. L. Cassady to vice president and treasurer; and R. W. Husted to secretary and counsel . . . Toledo Ed ups John K. Davis from vice president and assistant general manager to executive vice president and assistant general manager. W. A. Marshall, erstwhile secretary and treasurer, becomes vice president and secretary, meanwhile R. B. Williams is named treasurer and assistant secretary **(p 116).**

New vp's at Dayton Power & Light are Kenneth G. Oxley, vice president and manager of all electric operations; E. J. Rommel, vice president and manager of commercial division; J. V. Colley, vice president, treasurer, and assistant secretary . . . John Chiles, Jr, and B. M. Brown get vice presidencies at Westinghouse **(p 118).**

MANUFACTURERS ▶ **Westinghouse ships a 5,000-Mva circuit breaker to Florida Power & Light . . .** Link Belt Co is supplying Memphis, Tenn., Light, Gas & Water Division with a coal-handling belt for the latter's new steam plant . . . Line Material shows substation model pointing up design features and structural standardization **(p 102).**

NEW EQUIPMENT ▶ **Two new smaller transformers have hit the market.** First is a 15-kv and below distribution job put out by Allis Chalmers. The second is network unit (ratings to 750 kva) by Westinghouse. General Electric has come up with some outdoor disconnecting switches, rated to 345 kv, with a rotating vertical blade for breaking ice **(p 87).**

ENGINEERING TRENDS

Transmission lines may double as TV antennas in Southern Rhodesia, according to plans of the Kariba Gorge hydro-electric project.

If organic material is used for electrical equipment insulation in nuclear power plants, such equipment must be provided with protective shielding to prevent deterioration or undesirable chemical or physical changes caused by exposure to radiation.

Ultrasonic cleaning will probably invade the meter and instrument field. Long Island Lighting Co reports a possibility of saving $11,000 annually by using this method to clean cumulative-demand registers.

Electrical engineers are becoming the coordinating engineers of projects, tying all phases together and often interpreting them to management, said AIEE Vice President J. H. Foote at a recent Institute district meeting.

In no reactor will a fission-releasing accident—even within the containment structure—occur from a single equipment failure or a single operating error, as far as can be predicted. This was cited by the AEC in its study of theoretical possibilities and consequences of major accidents in large nuclear power plants.

Multiple-stage sea water distillation may produce electricity as a by-product. Pilot plant near Wilmington, N. C. will be built this fall by W. L. Badger. Engineers estimate that 55-Mw of generation will be produced by a plant designed to make 17 million gal per day of fresh water. Basic process is adaptation of methods used by naval vessels to evaporate sea water for boiler makeup.

FROM EDITORS IN THE FIELD

Electric hammers drive ground rods easier for distribution transformers. Florida Power Corp powers the hammer from the transformer secondary or from a portable 1.5-kw generator.

Butyrate plastic pipe cuts cost of underground conduit for New Orleans Public Service, Inc. The flexible, light-weight, easy-to-cut pipe simplifies handling and fabrication in the field. NOPSI is using it for services, residential distribution, street lighting, and repairs to broken conduits on circuits rated up to 600 amp.

Street lighting costs have been cut to $13.22 per 1,000 lumens in Agawam, Mass. This reduction from $16.00 in 1954 has been accomplished by a cooperative program which began with Western Massachusetts Electric Co putting 2,500-lumen lamps in open reflectors, followed by 20,000-lumen mercury units in heavy-traffic areas.

"Nothing to it! . . . Putting up the new L-M fluorescent luminaire is easy!" says Carl Hawkinson, Superintendent of Edwards Construction Company, Geneseo, Illinois. "One man can do the job. All you need is a screwdriver, a crescent wrench, and a level."

L-M's New Fluorescent Luminaires Have Slim, Modern Look . . . Easy To Install

L-M's new fluorescent luminaires are styled to give an up-to-date appearance to your streets. Their broad, cool, white light source and efficient reflector system create a cheerful atmosphere in the area, and greatly increase the scope of vision for both the motorist and the pedestrian.

Easy to Install, Easy to Maintain

L-M's new luminaires are conveniently packaged to facilitate installation. Housing is packaged separately so it can be installed first. With the housing in the inverted position, the reflector can be quickly and easily attached and wired. The unit is then rotated 180 degrees, leveled, and clamping screws are tightened.

One piece, side-hinged plastic globe and reflector assembly opens from either side. The luminaire is easily accessible for installation wiring, cleaning, or relamping. L-M's new luminaires are the only units available today that are designed to take both present and future very high output fluorescent lamps.

Get Complete Information

L-M's new street lighting luminaires are available in deep and shallow styles, in both four- and six-foot lengths. For other outdoor lighting applications, such as parking lots, store front lighting, etc., other styles are available. L-M Street Lighting Engineers will cooperate with you in designing the best system for your area.

Ask your L-M Field Engineer or Street Lighting Engineer for more complete information. Or write Line Material Industries, Milwaukee 1, Wis. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

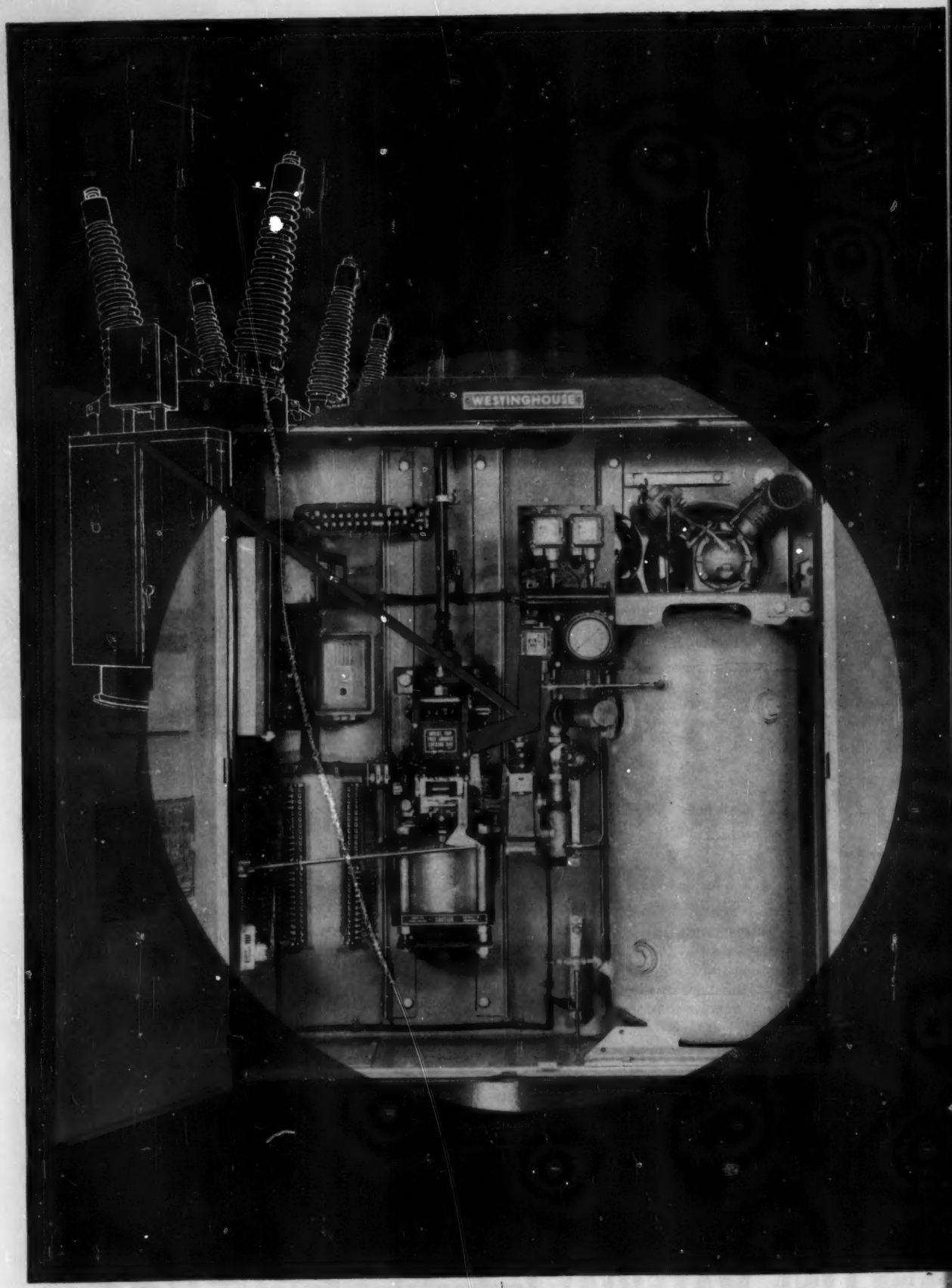
McGRAW EDISON

LM

LINE MATERIAL Industries *Street Lighting*

McGRAW-EDISON COMPANY

130A


WESTINGHOUSE

Power Circuit Breaker Pneumatic Operating Mechanisms

TROUBLE FREE AND TRIP FREE, MECHANICALLY AND ELECTRICALLY

The proof of the pudding is . . . six full years of trouble-free service in the field since introduction to the industry.

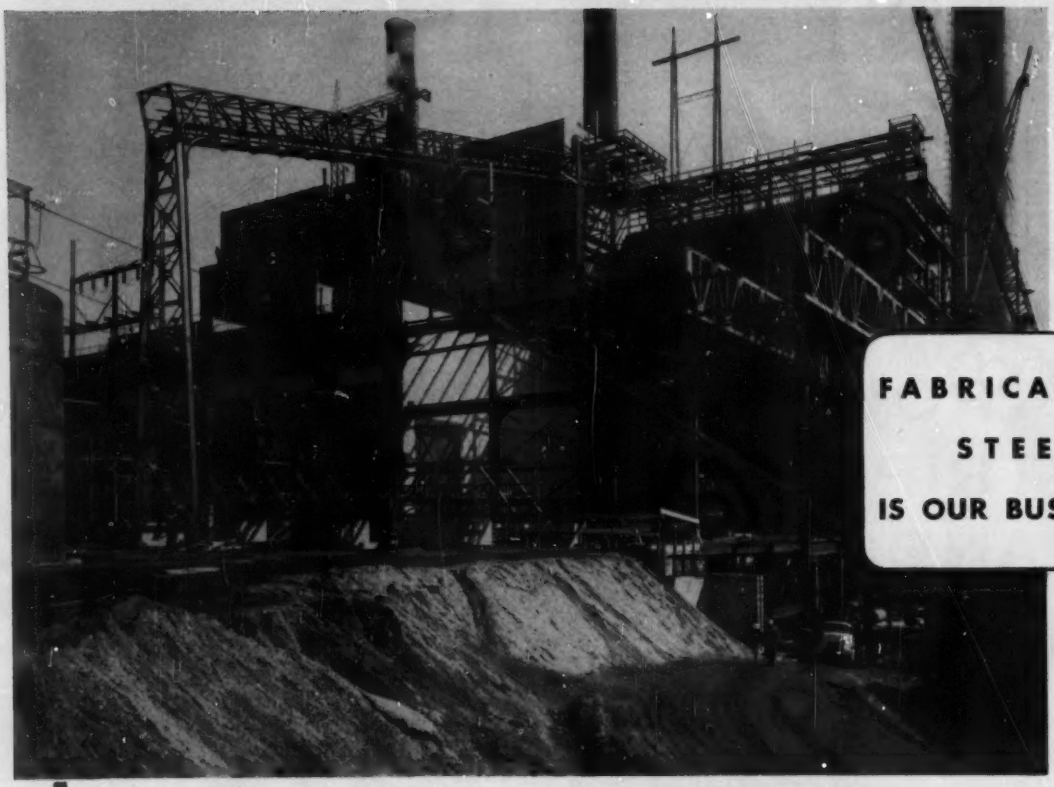
Three basic models of Westinghouse pneumatic operating mechanisms, the AA-7, AA-10, AA-14, handle the full line of Westinghouse oil circuit breakers—14.4 kv, 500 mva to 345 kv, 25,000 mva.

Both mechanically and electrically trip free, the breaker will trip open in standard operating time when closed against a fault. A single mechanism operates all three poles simultaneously, eliminating system unbalance due to nonsynchronized closing. These rugged and powerful mechanisms are fast, too—reclosing in 15 or 20 cycles. Roller-bearing latches need no field adjustment for life.

Automatic selection of trip-free or non-trip-free operation results in ultra-high-speed reclosing on larger breakers.

Your Westinghouse sales representative has complete details and specifications—or you may write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60919

YOU CAN BE SURE... IF IT'S Westinghouse



FABRICATING STEEL IS OUR BUSINESS

Ohio Power Company, Muskingum River Steam Plant, Unit #3. Steel Erection: The Ingalls Steel Construction Company.

RELIEF AT RELIEF (in Ohio)!

One of the richest industrial areas in Ohio lies along the 110-mile Muskingum River. Units #3 and #4 of the Ohio Power Company's big plant at Relief, Ohio, are important additions in this company's program . . . to meet the demands for more power.

6,000 tons of Ingalls' fabricated steel is going into the construction of the two added units of the Relief Plant. The fabricated steel is being erected by The Ingalls Steel Construction Company.

Ingalls' long experience, skill and ability in power plant requirements for fabricated steel have served importantly in the construction programs of 46 of the nation's leading power companies. Other thousands of commercial and industrial buildings are standing proof of Ingalls' ability to meet *all* demands, where fabricated steel is an important factor.

Can we help you? *Ingalls can serve you better* . . . for complete information regarding *why* and *how*, write:

INGALLS' PLANTS GREATLY EXPANDED

Capacity has been increased nearly 70% at Ingalls' Plants within the past three years . . . part of a program designed to give Ingalls the facilities to meet every modern requirement for fabricated structural steel for any construction purpose.

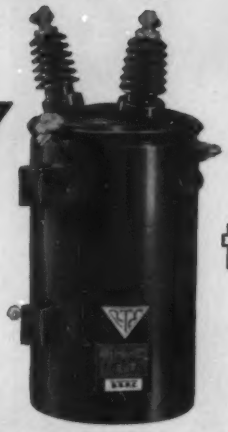
THE INGALLS IRON WORKS COMPANY

Established 1910

BIRMINGHAM, ALABAMA

Plants: Birmingham, Ala., Verona, Pa., North Birmingham, Ala., Decatur, Ala., Pascagoula, Miss.

FABRICATED STEEL for Power Plants • Hangars • Stadia Stores • Bridges • Office Buildings • Theatres • Hotels Apartment Houses • Hospitals • Churches • Schools • Industrial Buildings • Tanks • Bins • Pressure Vessels • Stacks



transformers

EASY TO INSTALL

Light, compact design makes handling easy.

- **Standard EEI-NEMA mounting brackets.** Upper bracket on tank has jump proof lug.
- **Both high and low voltage bushing terminals will accommodate either copper or aluminum conductor** in full range of sizes required by NEMA Standards.
- **Ground connector can be rotated** to provide three possible ground wire entrances.
- **Locked type secondary bushings** provide safe, speedy hookups.

EASY TO MAINTAIN

R T & E's new transformers are loaded with features to minimize maintenance.

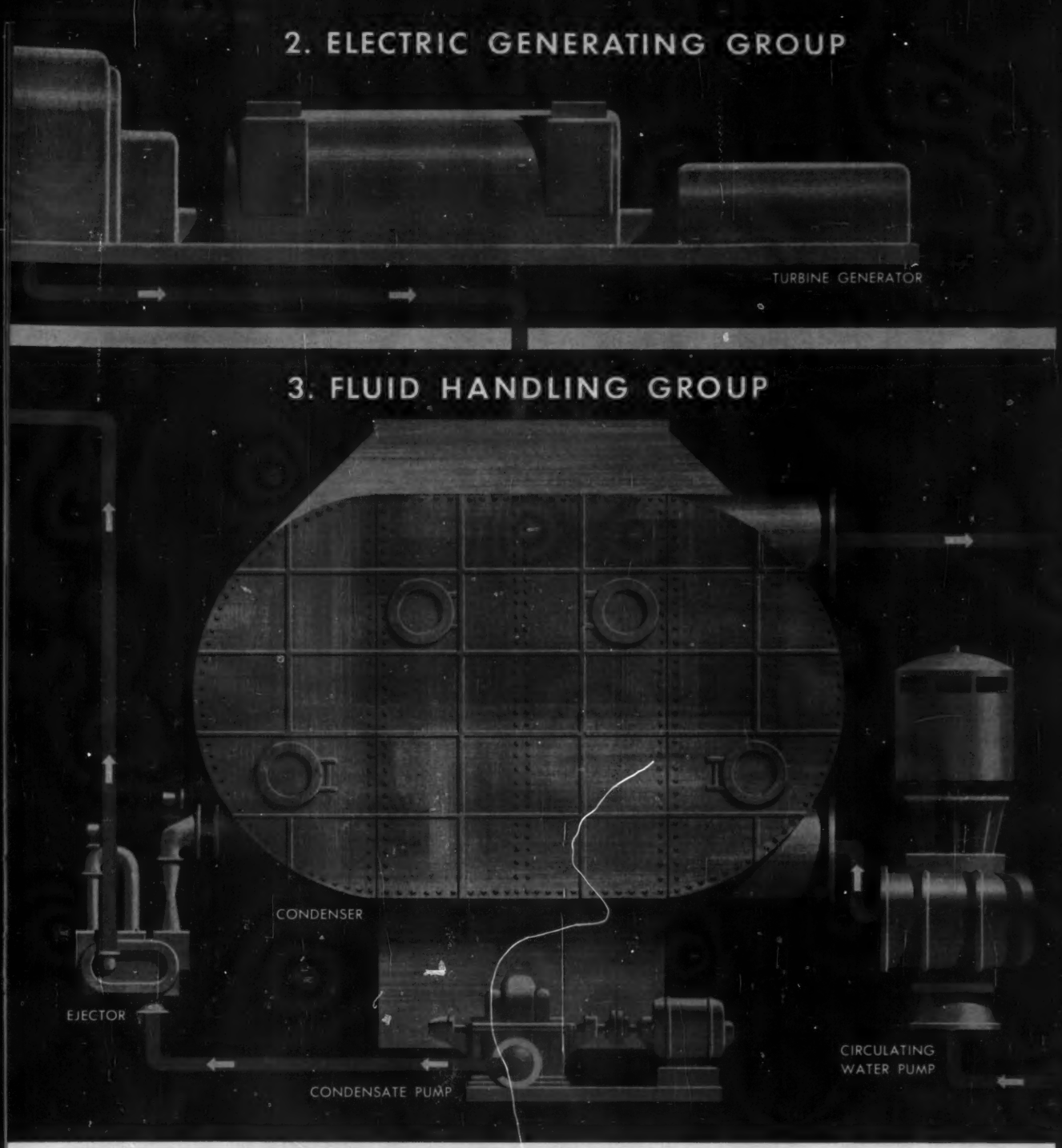
- **Externally operated tap changer** eliminates entering tank; handle is marked for easy identification of tap position. Taps can be changed readily without disturbing transformer seals.
- **Terminal failures due to stress corrosion are minimized** by use of special aluminum bronze alloy terminals.
- **Band type cover clamp** and tank cover can be removed as a single unit.
- **Completely "Weather Protected" to resist corrosion** by three coats of baked on modified alkyd paint, arc welded seams, stainless steel band type cover clamp and stainless steel mounting pads.
- **Inhibited Oil—(D.B.P.C.) effectively increases transformer life** up to 15 times by reducing sludging.
- **Locked type secondary bushings** will not turn when line leads are attached thus maintaining tight gasket seal.

equipment to help provide power for America R T & E CORPORATION
WAUKESHA, WISCONSIN

Look at all three

A new steam station design approach is bringing higher efficiencies, lower costs, and greater reliability. In this approach, only three basic functions are considered: (1) Steam Generating, (2) Electric Generating. (3) Fluid Handling. Station requirements are first analyzed in terms of the over-all job performed by each of these groups rather than by each individual piece of equipment.

Many of the benefits of this approach occur in the Fluid Handling Group. Here coordination and integration of the wide variety of equipment used can often effect substantial improvement in over-all operation. As steam temperatures and pressures go up, there are increased demands on the fluid handling function. Plant reliability often depends on the effect of one component of the fluid handling group on another during operational transients, either planned or of emergency nature. The solution is coordinated equipment



for power!

selection, engineering and design. And Worthington's "system" know-how and experience with modern complex plant cycles can help solve your fluid handling problems.

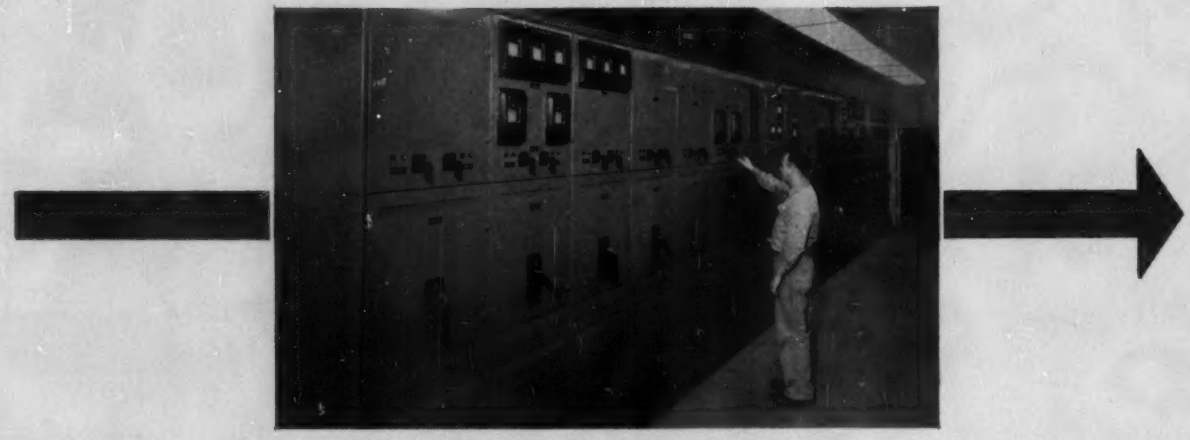
System-wise experience As the manufacturer of all major components of the Fluid Handling Group, Worthington has a reservoir of experience and knowledge that can be of benefit to you. To put this "system-wise" experience to work for you, get in touch with your nearest district office. Or write to section C-71, Worthington Corporation, Harrison, New Jersey.

WORTHINGTON

LOW VOLTAGE SWITCHGEAR

SAFEST!

No live parts exposed even in test position



No Open Doors to create hazardous conditions or mar the fine appearance of the I-T-E Low Voltage Switchgear when circuits are blocked.

Consider the additional protection offered by unexposed live parts even in test position and you will understand why I-T-E Low Voltage Switchgear is the safest of them all. And there are many other reasons why this is so. Here are some of them:

Test Position with Doors Closed. I-T-E's exclusive extendible escutcheon method establishes a new standard of safety and convenience in testing circuit breakers.

Reduced Handling. Circuit breakers can be stored in their respective compartments, de-energized, with doors closed.

Dust and Dirt Protection. The flat dust-seal frame which surrounds the escutcheon keeps the circuit breakers free of dirt and dust.

Extended Escutcheon tells at a glance when the circuit breaker is in the disengaged or test position.

Interlocked. A mechanical interlock prevents the circuit breaker from being moved from or into the engaged position unless the primary contacts are open.

No Open Doors to create safety hazards or mar the modern, attractive appearance of the switchgear when the circuits are de-energized.

For complete information about the safest switchgear of them all, contact the nearest I-T-E District Sales Office, or send for a copy of Bulletin 6004B. I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

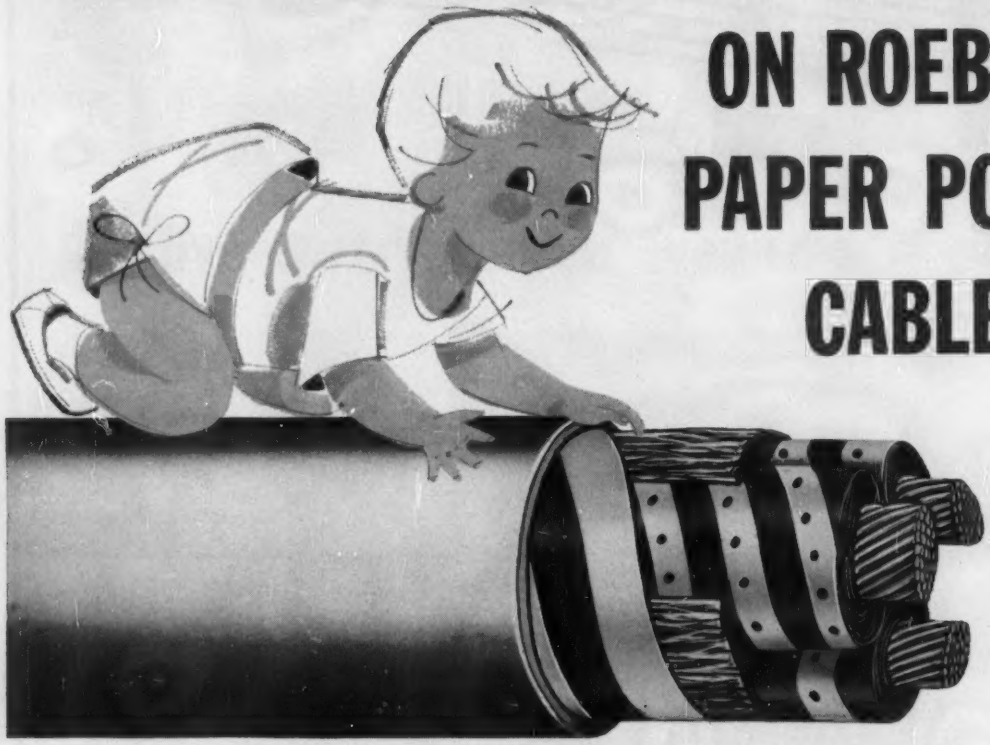
IN CANADA: EASTERN POWER DEVICES LTD.

No Live Parts Exposed even in test position. The exclusive I-T-E extendible escutcheon method establishes a new standard of safety and convenience in testing circuit breakers.

OPEN
I-T-E

Where CREEP is a problem . . .

TESTS PROVE 90% LESS CREEP IN TELLURIUM LEAD ALLOY SHEATHING ON ROEBLING PAPER POWER CABLE!



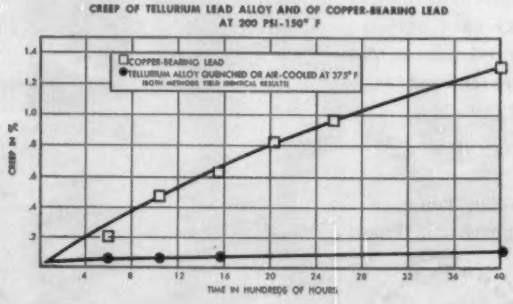
Roebling electrical wires and cables are available with either copper or aluminum conductors.

Only *one-tenth* the creep of ordinary cables—that's just one of the unusual properties of Roebling Tellurium Lead Alloy Sheathing on paper power cable, as shown by exhaustive creep tests in Roebling laboratories and by outside research. These impressive laboratory results are matched by field experience with thousands of feet of Roebling cable with Tellurium Lead Alloy Sheathing.

Look at the results on the graph yourself. You'll see that at 150° F Roebling Tellurium Lead Alloy Sheath stands up remarkably well, where copper-lead sheath, under the same conditions, stretches nearly 1.3% after only 4,000 hours at 200 psi.

Couple the unusual superiority of Tellurium Lead Alloy Sheath with the serviceable inner construction of Roebling Paper Power Cable—the uniform controlled-tension application of the paper tapes, for instance—and you have more than one reason why this cable is being specified by name, more and more, wherever power cable has to last a long, long time.

Write for full particulars today . . . rid yourself of cable problems tomorrow!

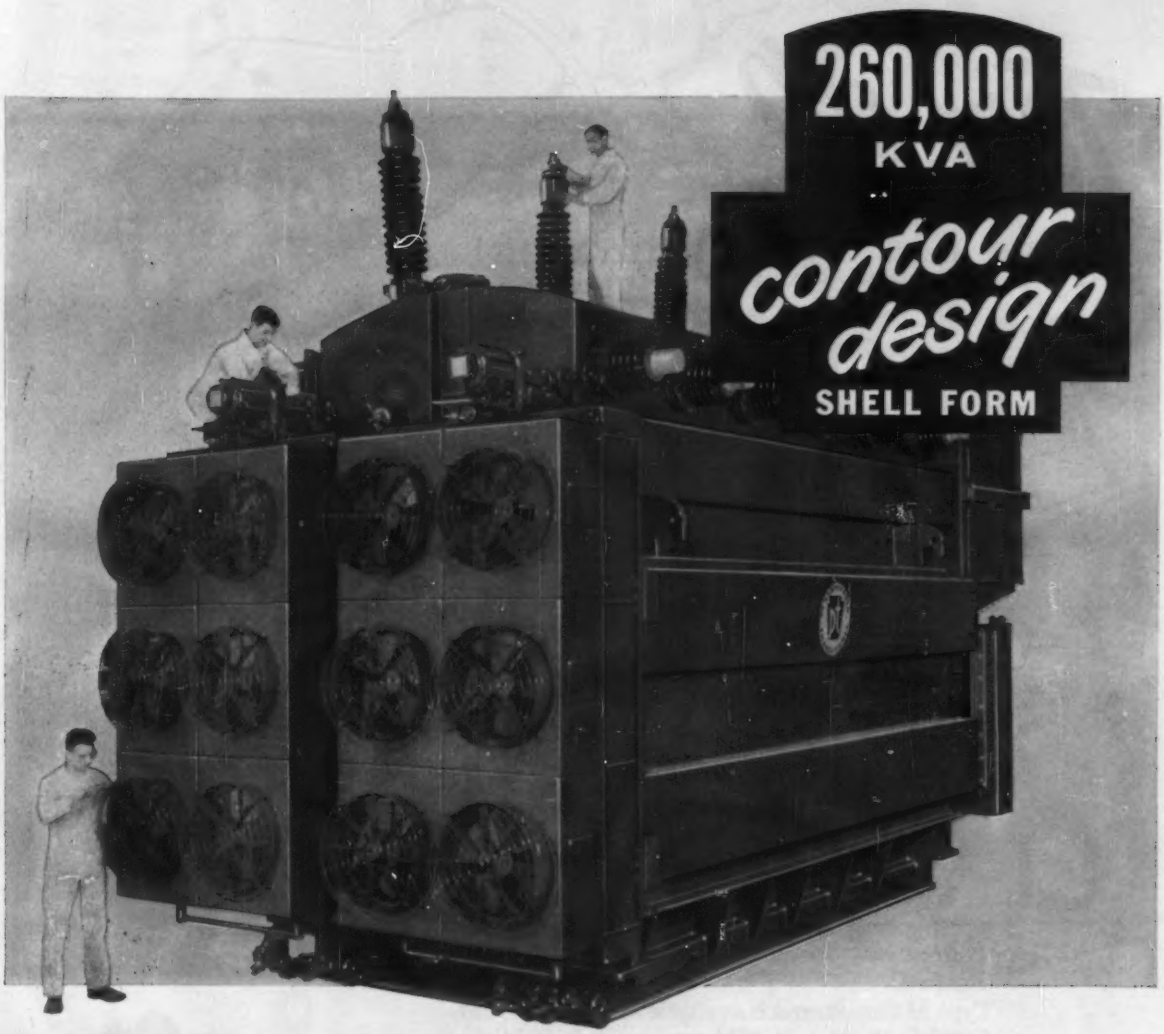


ROEBLING

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J.

Subsidiary of The Colorado Fuel & Iron Corporation

Branch Offices in Principal Cities



PENNSYLVANIA MAIN STEP-UP GENERATING STATION TRANSFORMER

Significant savings in installation costs resulted from the upright, one-piece shipment of this large three-phase, main step-up generating station transformer. Such handling was possible because of Pennsylvania's Contour Design, which permitted the manufacture of a unit so compact that only bushings and coolers were removed for shipment.

Designed and manufactured by Pennsylvania for a midwestern utility, the transformer will step up a generated voltage of 15,000 volts to a transmission voltage of 141,000 volts. Two low voltage sections of 15,000 volts are rated at 130,000 kva each. A duplicate unit, for delivery in 1958, has been ordered. Pennsylvania Transformer Division, McGraw-Edison Co., Canonsburg, Pa.

.. by the PIONEER of 1-piece, upright shipment of large power transformers

PENNSYLVANIA POWER TRANSFORMERS

Tear up

those old cost estimates!

The low prices of the new Copperweld* Type M Guy Strand make your old cost estimates out-of-date! Copperweld has always given you more years of service per dollar of cost. Now, prices on Type M Guy Strand make first cost lower and more attractive.

Basically, the principle of the new Type M Guy Strand is still the same—each wire has a heavy copper sheath inseparably molten-welded to an alloy steel core. Lower prices result from a new higher strength strand developed by Copperweld research, and from new specialized guy strand production techniques.

Type M Guy Strand is available in 2.2M, 4M, 6M, 8M, 10M, 12.5M and 16M strengths. It is pliable—easy to install. And, because of the molten-weld, the copper will not crack, flake or peel. Write today for complete details about this money-saving product.

*Trade Mark

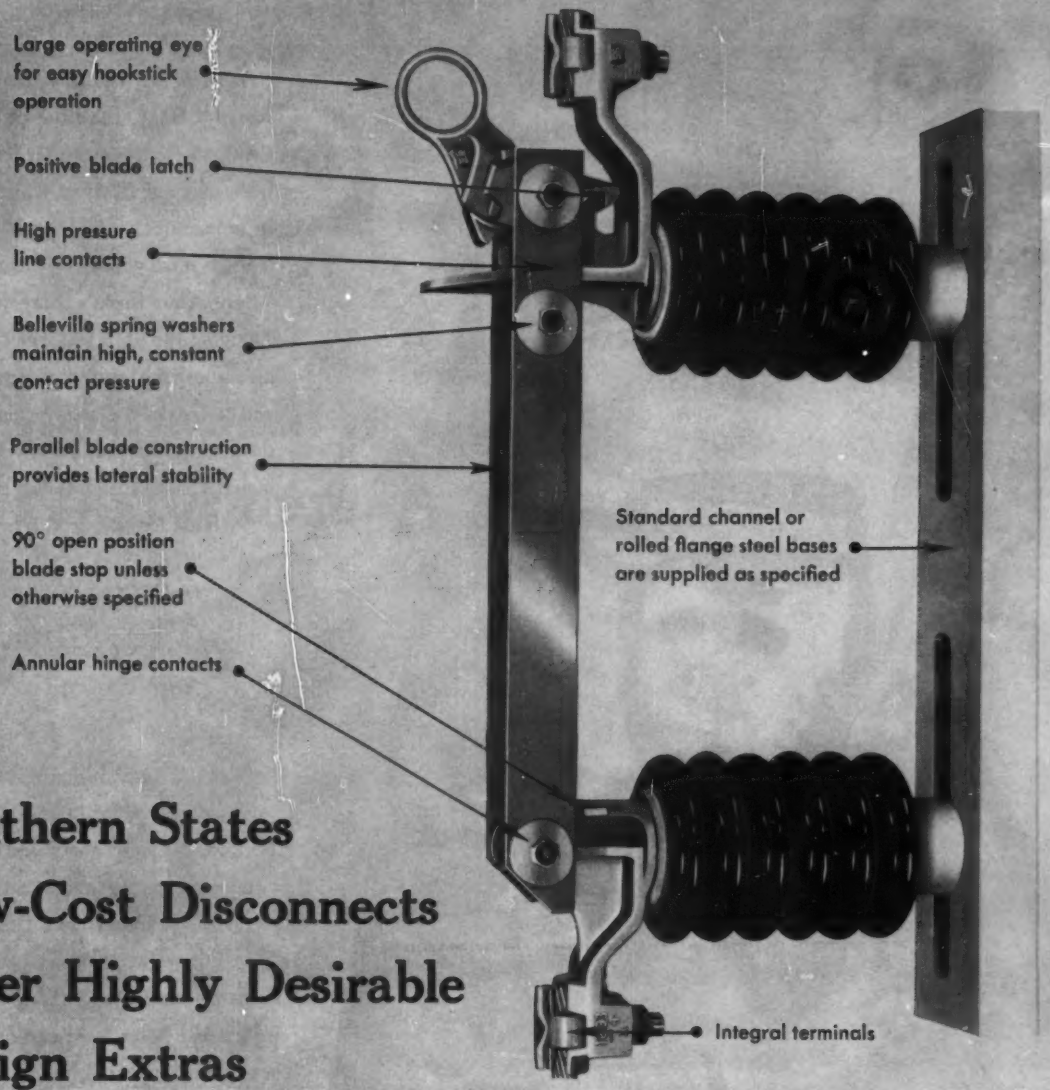
COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

GET THE FACTS ON

New Copperweld TRADE MARK

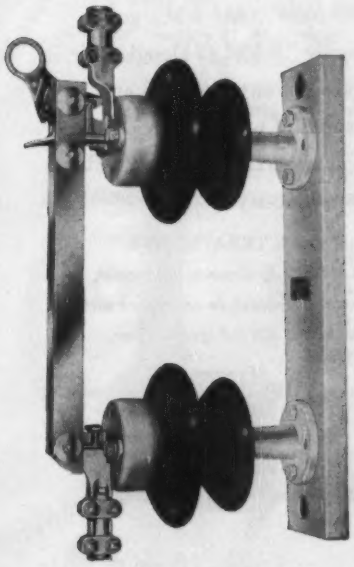
COPPER MOLTEN-WELDED TO STEEL

TYPE M GUY STRAND


Large operating eye for easy hookstick operation
Positive blade latch
High pressure line contacts
Belleville spring washers maintain high, constant contact pressure
Parallel blade construction provides lateral stability
90° open position blade stop unless otherwise specified
Annular hinge contacts
Standard channel or rolled flange steel bases are supplied as specified
Integral terminals

Southern States Low-Cost Disconnects Offer Highly Desirable Design Extras

TYPE PH



TYPE PHM

As the illustration shows, the Type PH Disconnect has many features usually found on more expensive switches. With these highly desirable design extras available on a low-cost product, it is easy to justify its use on low-revenue distribution lines for isolating, by-passing, or disconnecting.

The Type PHM, shown in the smaller illustration, has all of the features of the Type PH. The only difference is that it has NEMA Standard insulators.

Both switches are single-throw, single-pole, hookstick operated. The PH may be mounted in vertical or underhung positions on wood crossarms. The PHM may be mounted on either steel or wood structures.

Full details will be furnished by your Southern States representative.

Both the PH and PHM are available in 7.5-15 kv, 200, 400, 600 amps. Also available are Southern States PHT and PHMT Tandem Transfer Switches in same ratings.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

© J. H. Baxter & Co. 1956

"A hundred twenty five foot long!" Babe, the Blue Ox, dropped the tape off her left horn as Paul Bunyan whistled in amazement. His breath leveled nine young saplings. "Babe, that there's shore some Douglas Fir pole. An' she's jest as smooth an' round an' straight as the legs of a Barbary Coast dancin' gal...Babe, I *know* this'n is a BAXCO Douglas Fir Pole* —without lookin' at the brand."

BAXCO
(*pressure treated*)
DOUGLAS
FIR POLES

* But it's a good idea to look for that BAXCO brand, Paul... because it means the poles were cut from choice stands (mostly our own) of Coast type Douglas Fir timber—where trees grow extra tall and straight...it means the poles were carefully seasoned, inspected, machine shaved and machine incised full length before careful pressure treatment...and when you specify "BAXCO Douglas Fir Poles" of any size, you are assured of prompt service and rigid adherence to specifications. Inquire today.

PRESSURE TREATMENTS AVAILABLE: *Creosote, Chemonite, Pentachlorophenol, in accordance with Federal and AWPA specifications.*

J. H. BAXTER & CO. *120 Montgomery Street, San Francisco 4, California*

FREE...

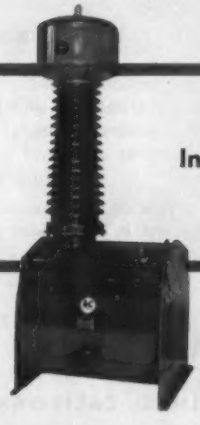
New 24-Page Treatise on Instrument Transformers

Available to Schools and Training Classes

UTILITY metering superintendents, industrial electrical engineers, switchboard builders — here's a desk-mate you will consult often and profitably. Instructors in engineering schools and on-the-job training programs — you will want to use this informative bulletin as a textbook. It's the most complete treatise ever compiled on the theory and operation of instrument transformers.

Included are comprehensive data presented in handy reference form, typical performance curves and a handy ratio-phase angle correction chart.

Single or quantity copies are yours for the asking. Write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

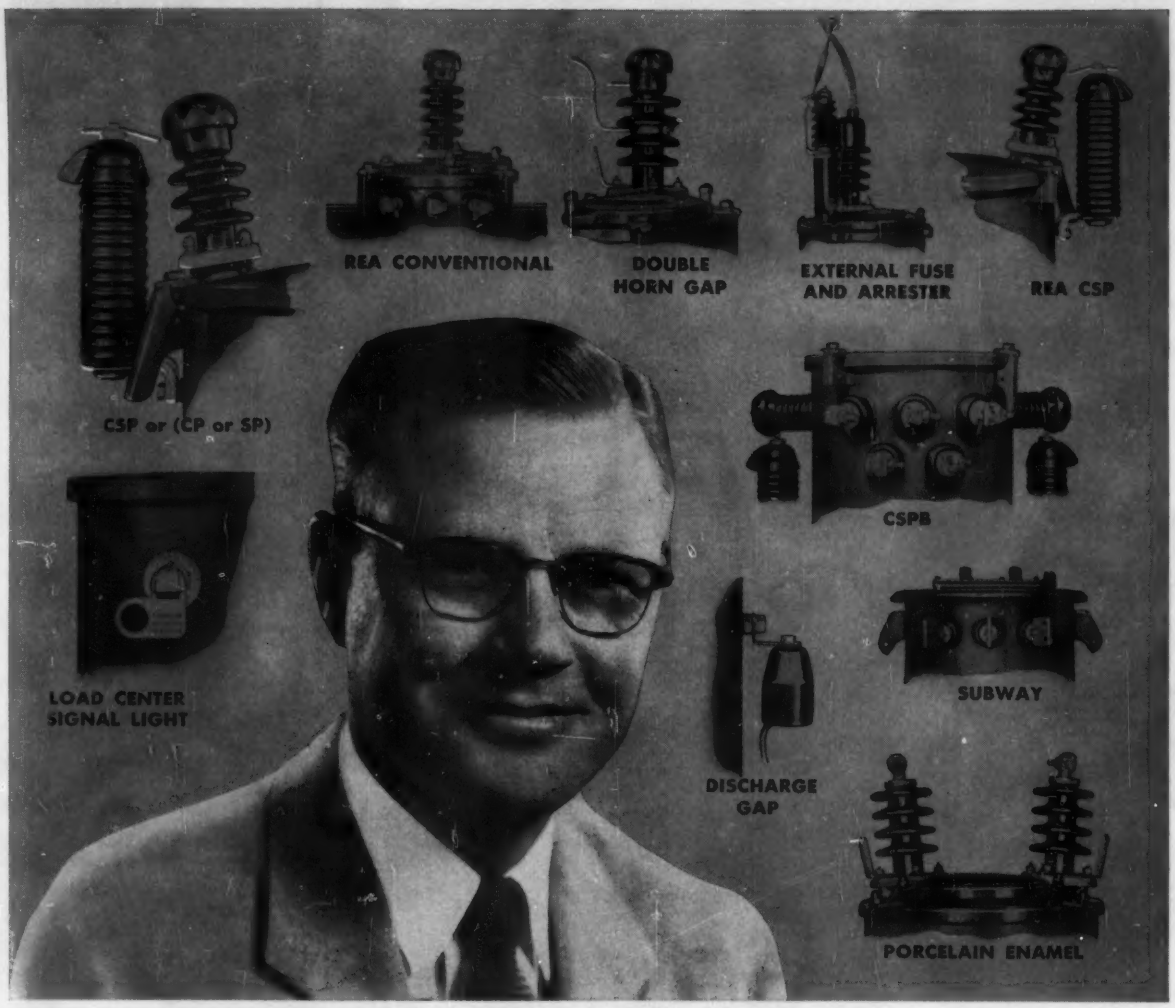


Allis-Chalmers Instrument Transformers Available in Over 400 Ratings

Name the application. There's an Allis-Chalmers instrument transformer that fills the bill precisely. Indoor, outdoor, dry-type, oil or compound-filled units — they are all available in the widest possible rating range.

ALLIS-CHALMERS

A-5386



KUHLMAN "Salesman of the Week" If you can identify this Kuhlman representative, and are the first one to notify Dept. SA-1, Kuhlman Electric Co., Bay City, Mich., you will receive a valuable gift.

"TAKE A LOOK AT THIS DISPLAY OF KUHLMAN DISTRIBUTION TRANSFORMERS . . .

. . . It will give you some idea of the many design variations Kuhlman offers. Conventional . . . CSP . . . REA . . . Subway . . . Banked (CSPB)—whatever your transformer needs are, Kuhlman has just the right unit for the job.

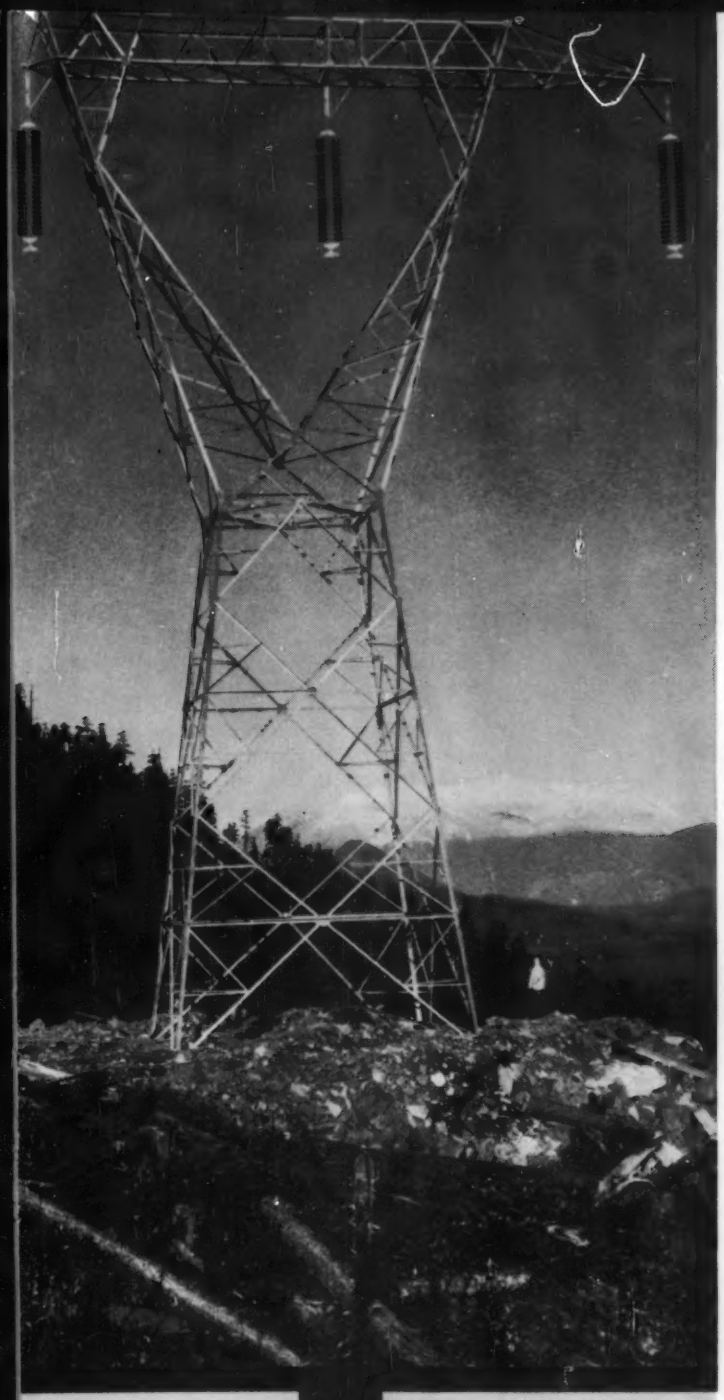
"Each design is light, compact and easy to interchange as your load grows. Most feature "Quick-Grip" insulated high voltage bushings for ratings above as well as below 5 KV. In the CSP line you have a choice of either expulsion or valve type arresters. And for special requirements you can order: over-load signal lights for conventional transformers . . . oversized bushings for increased creepage and high altitudes . . . discharge gaps for ungrounded tanks . . . porcelain finish for corrosive atmospheres . . . and many others.

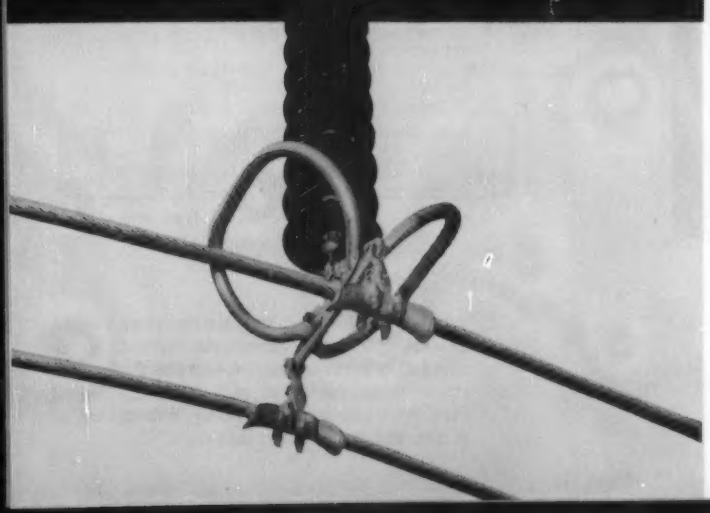
"I've been able to illustrate only a few of the possibilities here. If what you need is not here, get in touch with your local Kuhlman representative. He'll give you the whole Kuhlman story."

5712b

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA





How to build a 345-kv line with 230-kv Corona and RIV

British Columbia Electric does it, with an assist from C-O-B

"Give us corona characteristics and radio influence voltage for 345-kv transmission that is no higher than would normally be expected for 230-kv."

That was the problem posed to Canadian Ohio Brass by British Columbia Electric Company back in 1950 when B.C.E. decided to establish an extra-high-voltage grid operating at 345-kv, the first system at this voltage in North America using a two-cable, horizontally spaced conductor bundle.

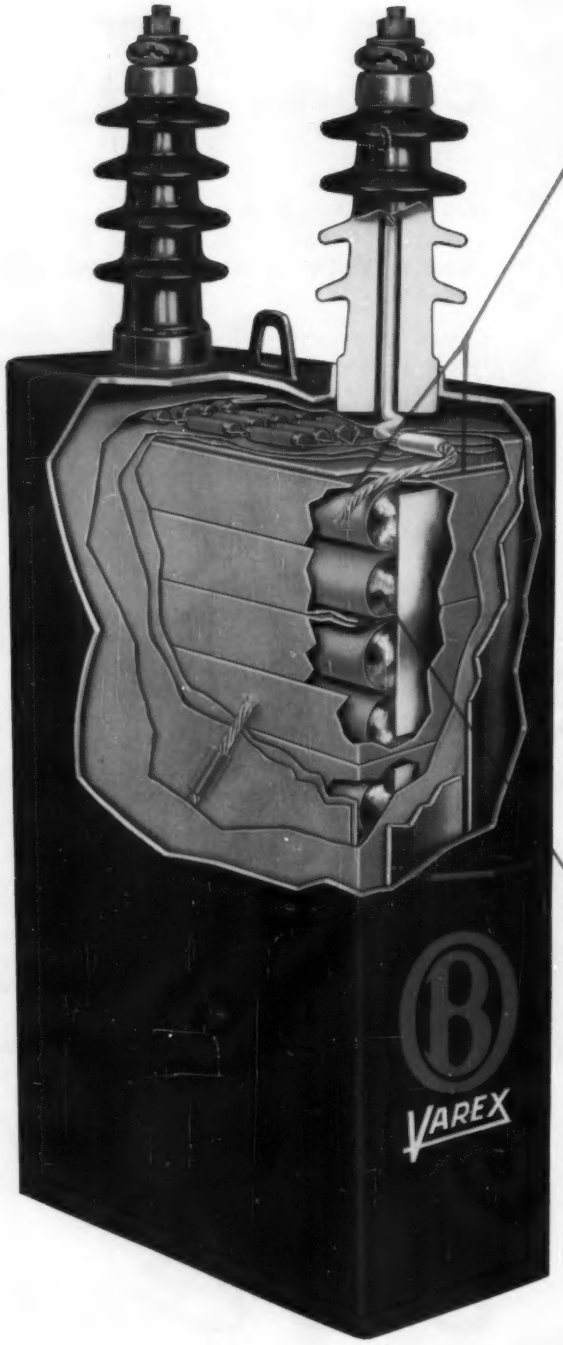
Tests were conducted by O-B to determine bundle spacing and type of hardware needed to meet the RIV and corona level specified. One of the important findings: the mutual shielding effect of the two conductors lowered radio influence level. Also, standard conductor clamps in the suspension position met the radio requirements. For the insulator string, tests showed it was desirable to provide shielding rings to redistribute voltage in the conductor end of the string.

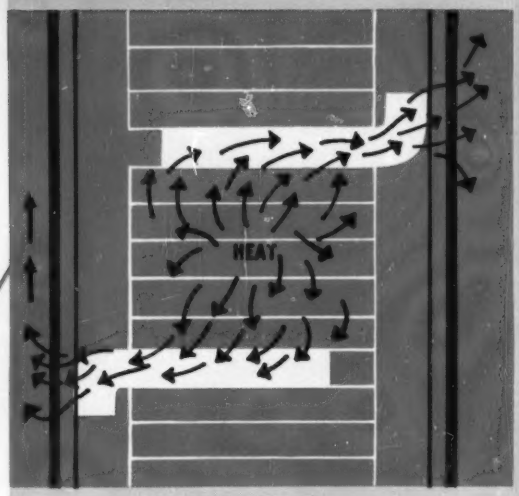
This is typical of the help Ohio Brass has provided power companies that build or plan EHV transmission lines. With the cooperation of our customers, we've already found many answers to EHV transmission problems. If you have any special problems pertaining to insulator or hardware performance at EHV, we're confident they can be solved, too. Probably we have already made most of the required tests.

So if you're considering EHV in your system, there's no need to wait. We can help you get the benefits of EHV transmission right now.

OHIO BRASS COMPANY, MANSFIELD, OHIO
CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Ohio Brass



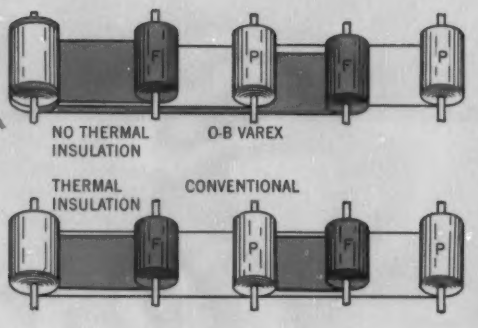


Capacitor operation generates a certain amount of heat, from inherent dielectric losses of the insulating paper and of the liquid used to impregnate the capacitor, and from resistance losses in leads, foils and discharge resistors.

In Varex, the temperature rise is held to a minimum: first, by holding down internal losses through use of low loss dielectric materials; second, through the foil cooling principle which permits efficient transfer of heat to the case.

With foils extending beyond the elements, there is a minimum amount of thermal insulation between the foils and the case, but the insulation is dielectrically strong. This arrangement permits ready transfer of heat from foils to case sidewalls.

Horizontal arrangement of Varex elements also aids in heat transfer. Heat flows freely to vertical container sides, makes efficient use of them as radiating surfaces, and takes advantage of convection currents that naturally flow upward across a vertical surface.



Here's the difference between the Varex method of winding and the conventional method. Aluminum foil in Varex extends beyond insulating paper, providing an unblocked path for dissipation of heat. With conventional winding, foils are buried at both ends under paper insulation.

Since Cool Capacitors Last Longer

WE MAKE IT EASY FOR THE HEAT TO FLOW OUT OF VAREX

"Capacitors are designed to operate at comparatively high dielectric stresses for reasons of economy. The combination of these stresses with operation at high temperature for extensive periods of time will result in gradual deterioration and shortened life . . ."

This paragraph from NEMA standards indicates the importance of keeping the inside of a capacitor cool . . . the cooler it is the longer it will last, everything else being equal.

A fundamental consideration in developing the new Varex capacitor was to provide for efficient dissipation of internal heat. Here's how it's done:

1 — Each of the two aluminum foils in the Varex elements extends (at opposite ends) beyond the paper insulation. There's an unobstructed path through which heat can flow from the center to the end of the element. This is "foil cooling."

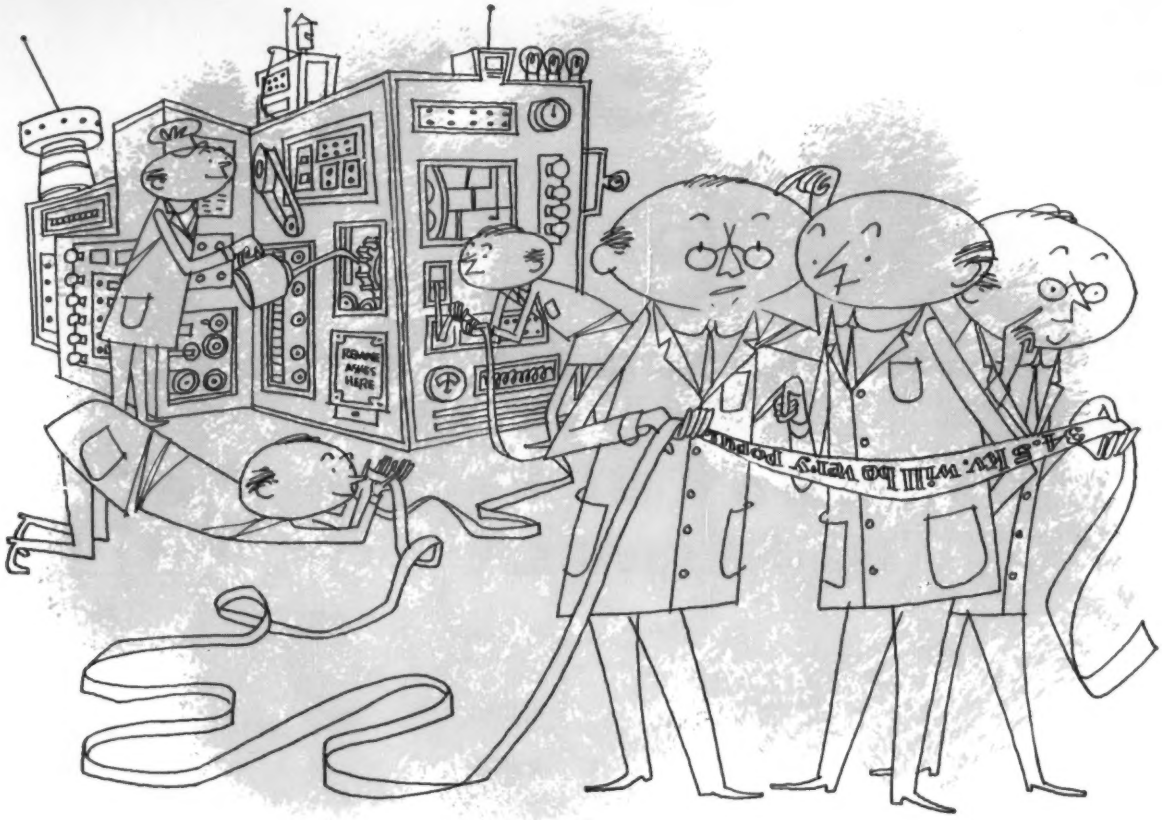
2 — With foil extending at each end of the element, there is a minimum amount of thermal insulation between the element and the capacitor case, consistent with adequate electrical insulation to ground.

3 — Horizontal arrangement of Varex elements promotes effective use of container sides as radiating surfaces.

These Varex features provide a capacitor with thermal stability, one that gets rid of internal heat efficiently before temperature builds up. They make Varex a cool capacitor, and you can expect a cool capacitor to last longer when installed in your system!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass



Question: *What will be the common distribution voltage in 1965?*

Lightning-Vac: *34.5 kv will be very popular*

We had a brilliant idea. If the mythical O-B Lightning-Vac can predict at what pole and what time lightning will strike, why can't it determine the best distribution voltage for 1965 and the years beyond?

So we fed the question to Lightning-Vac. The answer came right through.

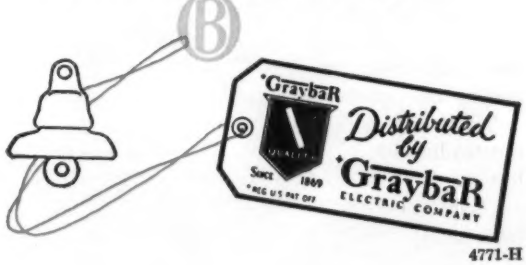
"34.5 kv will be very popular."

There were a few gasps of surprise. But then the calmer heads in the group began thinking. It seemed pretty logical. 34.5-kv had obvious advantages for distribution work. Residential load is still lagging far behind industrial and commercial load. Much more rapid growth is due in residential areas.

Whether you agree exactly with Lightning-Vac or not, we all know distribution voltages are going up. And Graybar and Ohio Brass will be glad to help you raise them. The nearby Graybar warehouse is bulging with O-B hardware and insulators. As you rebuild deadends, build them to fit the ultimate distribution voltage you expect to use in your system. We've got it straight from Lightning-Vac. It's the smart thing to do!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass



4771-H

Why We're Sponsoring Right-of-Way Conference

Some of the land has been cleared. Much of the material has been delivered to the site. But not a single hole has been dug for a fairly sizeable transmission line planned in a large eastern state. The work is already running several weeks behind schedule, and some fine spring weather is being wasted. Cause of this delay: The utility building the line just hasn't been able to obtain all the rights-of-way it needs for the line.

This is getting to be a pretty familiar story for transmission line contractors. And it is all too familiar to electric utilities. There was not a single letter of dissent when, a few months ago on our summary pages, we called right-of-way and site acquisition the "number one problem for many electric utilities." We dare say that it ranks among the top five problems for all electric utilities.

Now the towering problem threatens to grow even larger with the recent introduction of a bill in Congress which would prohibit utilities from running lines along highways built under the new federal road program.

Yet, despite the immensity and the vitalness of this expansion space problem, electric utilities do not have a single national forum for exchanging information, ideas, and experiences in this crucial area. It seems a bit ironic to us that existing national electric utility organizations have not seen fit to focus attention on this problem. Certainly the industry has made substantial gains from the exchange of information in many other of its problem areas.

To start the ball rolling toward the organization of a national utility forum on rights-of-way and site problems, Electrical World will sponsor a one-day conference in Chicago, May 15, just prior to the annual seminar of the American Right of Way Association. We undertake the sponsorship of this conference at the urging of a number of utility men who must daily confront the problems of acquiring rights-of-way and sites to provide for the expansion of our industry.

Our single objective in this conference is to open the ways of communication for the exchange of information in what we consider to be a vital problem area. We have no illusion that this one conference will solve any of the multitude of problems facing the harried utility real estate man. But we do most sincerely believe that the regular exchange of ideas among men working on a common problem is a healthy and worthwhile endeavor. We know that the sharing of ideas and experiences can contribute to the solution of problems in this area just as it has in the engineering, accounting, management, and many other fields of utility operation.

If we can open these lines of communication among rights-of-way and real estate men in the various utilities, we will consider the conference a success. We look upon sponsorship of this conference as another chance to fulfill our most important editorial objective—to help electric utility men do their jobs better, more efficiently, and more wisely by providing them with the best information available.

Don't Pull Punches on Safety

Edison Electric Institute's Accident Prevention Committee has released its gripping film, "Death of a Lineman." As the title suggests, the movie didn't pull any punches in preaching its safety message.

We are proud to follow up with a featured article, "Safety Breakthrough," in this issue (p 50). As you may judge from our opening illustration, we aren't pulling any punches either.

Safety engineers in electric utilities are doing an outstanding job in saving lives and preventing needless grief. Individually they have been extremely vocal. You can gather that from the frequent and lucid safety articles in utility house organs. As an industry group, these same men have sometimes been reluctant to speak out to the whole industry.

"Death of a Lineman" is a courageous move to change that. Our own "Safety Breakthrough" feature is further proof that these men do have a message worth preaching and that they're capable and willing to carry it beyond the confines of their individual service areas.

Both these efforts show that safety—a life and death matter—need not be handled in a trite or ponderous manner. We salute the safety engineers for their service to the industry in putting the film together. We are grateful to them for their aid in helping us compile "Safety Breakthrough."

Flood Insurance Plan Seen for July Launching

Nation's utilities await $50-million appropriation to get program going as new government agency sets up rates, terms

This week the federal government is just one step and $50 million away from launching an ambitious nationwide flood insurance experiment for utility, industry, business, and residential properties.

The $50 million must be provided by Congress. Last year Congress okayed the idea of federal flood insurance; now it must put up the cash to get the program going. The program, according to theory, should be virtually self-supporting once it starts rolling. In the meantime, an appropriation is needed: $36 million for paying possible first damage claims in excess of premium payments and $14 million for reimbursing private insurance agents who will sell and service the federally guaranteed policies.

As of now, the Administration's request for the $50 million is before a House appropriations subcommittee.

First Policies: Maybe July 1

If all goes well, the appropriations process in both houses should be finished in time for the first policies to be sold by the time fiscal 1958 begins, July 1.

For property owners, the major questions then are:

- What insurance is available?
- What will it cost?

Federal Flood Indemnity Administration, the government agency created to administer the new program, lays it out like this:

- Contracts for direct flood insurance of up to $10,000 will be available on residential dwellings.
- Direct flood insurance contracts of up to $250,000 will be offered on industrial plant, business, or other properties—including those of state and local governments.

FFIA is breaking new ground on the more complex matter of rates, simply because up to this time there has been virtually no flood insurance offered to U. S. property owners by private carriers.

After more than a year of studying all available statistics on flood frequency, damage, and risk, FFIA has come up with a new rate of $1 to $2.50 per year per $100 of coverage bought.

Regional Rates to Prevail

The rate will vary from region to region. FFIA has divided the nation into 14 recognized river basins. They are: Ohio Valley, Missouri Basin; North Atlantic area; Pacific area; Lower Mississippi Basin; Arkansas Basin; Red River Basin; Upper Mississippi Basin; Western Gulf; Great Lakes area; Eastern Gulf; South Atlantic area; Colorado Basin; and Great Basin, covering parts of Nevada, Oregon, and Utah.

Applicable rates within each basin will be uniform. That is, coverage for property within a recognized flood plain will cost the same as that for property on relatively high terrain. But the rate will vary from basin to basin.

FFIA isn't ready to publish base rates for each basin, but it is known that the maximum $2.50 per $100 rate will be applied in the Ohio Valley and the $1 per $100 minimum will be in effect for the Colorado Basin, where flood incidence is lower, past damages have been smaller in the aggregate, and economic concentration is low.

Translated into dollars and cents, this is what it means: An electric utility in the Ohio Valley will pay $2,500 per year in premiums for full flood coverage on a plant it values at $1 million. But a utility in the Colorado Basin can buy full coverage on a plant of equal value for $1,000 per year.

There are some noteworthy qualifications and exemptions.

First, the variable base rate of $1 to $2.50 is on an "80% contribution basis." For example, suppose a $100,000 plant were damaged by flood. If the owner is carrying at least $80,000 of federal flood insurance (80% of the plant's total value), he will collect for his losses in full—up to the face value of his policy.

However, if this same owner has failed to buy 80% of full coverage, he will be "penalized" unless his loss equals or exceeds $80,000. If he has bought only $60,000 of insurance, or three-fourths of what would be his 80% "contribution," and has a $40,000 loss, he will recover only $30,000—or three-fourths of his damage.

Second, rate surcharges will be levied on all policies written covering property in counties abutting salt water from the Canadian to the Mexican border. The surcharges will be 10% in coastal counties north of the Virginia Capes and 20% in coastal counties south of the capes to Florida and westward around the Gulf to the Mexican line.

These surcharges are dictated by hurricane hazards and attendant damage potential from wave wash.

Branch, McCune Air Power Needs, Problems

Industry leaders score federal power, 'crash program' philosophy, delay in passing indemnity insurance bill; see bright future for fusion power

The private electric utility industry was urged last week to ensure at all times that it is providing sufficient power—even before the power is needed—to maintain its independence in the face of those who would federalize the industry.

This warning came from Harllee Branch, Jr, president of the Southern Co, to the U. S. Chamber of Commerce's 45th annual meeting. Branch and Francis K. McCune, General Electric Co vice president, spoke on America's energy needs. Earlier, the convention heard from Charles J. Haugh, vice president of Travelers Insurance Co, on problems of insuring atomic facilities.

Warns Free Enterprise

Branch, replying to a question on where the push for federal power plants originated if not from the government, put at least a "modicum" of blame on "professed free enterprisers" who desire "federal largesse" in their areas. These people forget, he said, what one federal plant in an area can mean in the long run.

In atomic energy, Branch likened this country's atomic power program and those abroad to the race between the tortoise and the hare. Initial speed is not going to win this race, he said.

"I believe we are ahead of other countries and we are moving in a wider field in reactor construction," he said.

14 U. S. Projects Cited

He noted that 69 electric companies and associated organizations are engaged today in developing 14 nuclear reactor projects.

Opposing the possibility of federal construction of nuclear reactors, Branch said: "Mechanical energy—under government monopoly—can become a vehicle of tyranny and discrimination—degrading and demoralizing to the citizen and destructive of his freedom as well as his investments."

In this day when so many are clamoring for government "crash" programs in the fields of electrical and atomic power," he said, "we need to remember that some things are more important than speed."

Federal Indemnity Wanted

McCune told the delegates that unless there is passage this session of Congress of a federal indemnity insurance bill there will be no market for atomic power plants. And without a market, GE will not be manufacturing such plants.

McCune, also manager of GE's Atomic Products Division, said it was too early to give accurate cost estimates of atomic power plants. But he saw a need in the U. S. for nuclear energy to supplement energy from conventional fuels coming in the 1970's and 1980's.

H-Power Is Challenge

Looking further into the future, McCune said the attractiveness of fusion (hydrogen) power make it one of the greatest challenges to science today, because:

- The fuel supply for this reaction—deuterium, or heavy hydrogen atoms obtainable from the ocean—is literally inexhaustible.
- The cost of extraction per energy unit of deuterium, even today, is only a fraction of the cost of obtaining coal.
- The problems of atomic radiation and disposal of radioactive waste are far less serious for fusion reactions than for the fission process.

Haugh described the insurance problems peculiar to the atomic energy industry. These arise primarily because of the "phenomenal catastrophe potentiality," he said.

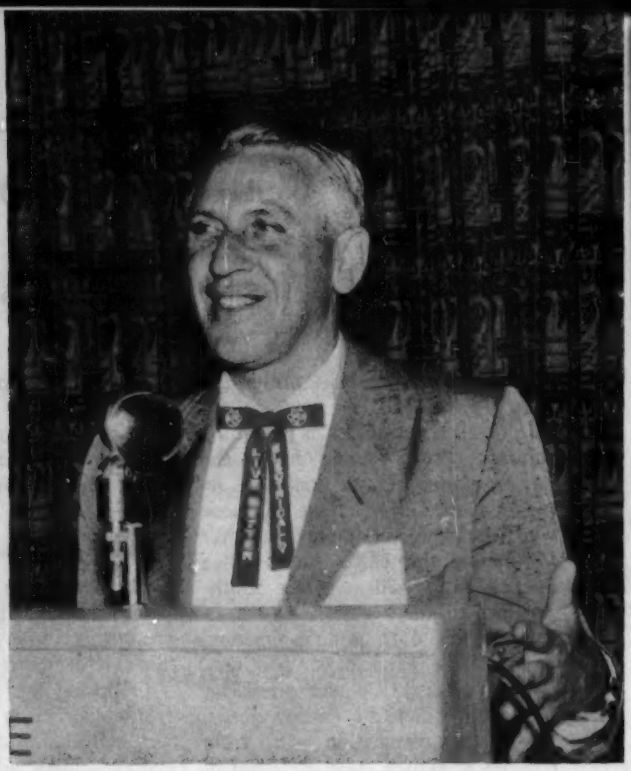
He emphasized however, "there is complete accord in the belief that although a catastrophe loss is possible, it is improbable."

HARLLEE BRANCH, JR

FRANCIS McCUNE

CHARLES HAUGH

R. S. STEVENSON, president, Allis Chalmers Mfg. Co: "Electrical equipment manufacturers spend three times as much on research as the all-industry average . . . Our company's 1956 research costs were triple those of 1951"



DONALD S. KENNEDY, president, EEI and Oklahoma Gas & Electric Co: "The industry must focus more attention on selling because of the drop in load factor—in some cases as much as from 70% to 50%"

Southwestern Electric Conference

A general air of optimism and sales-mindedness pervaded the third annual meeting of the Southwest Electric Conference that drew more than 100 utility executives to Chandler, Ariz., in mid-April. The optimism was apparent in the programmed speeches as well as in off-session conversations. Every speaker that found the chance pointed up the importance of an aggressive sales program.

Gordon W. Evans, president, Kansas Gas & Electric Co, was elected chairman of the conference, and M. L. Kapp, president, Interstate Power Co, vice chairman.

The role of the Edison Electric Institute was defined by Donald S. Kennedy, president of E.E.I. in the opening address. Kennedy pointed out its three areas of service to the industry, as (1) advancement of the art of making and delivering electricity, (2) gathering facts and statistics about the industry, and (3) helping members generate and sell electricity at the lowest possible price, all things considered.

Electric utility promotion cannot be considered entirely satisfactory, according to Kennedy, as long as automobiles draw four times as much consumer income as appliances. But on the positive side, he pointed out that in the past ten years energy sales were up 170% compared with 97% for gross national product and that average residential use was up 123% in ten years compared with 80% for disposable income.

Load-Building Is Stressed

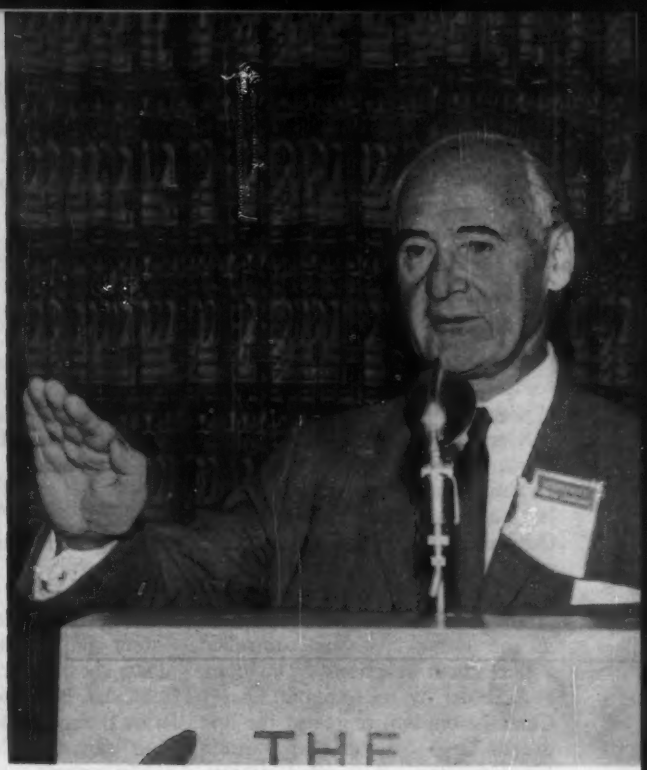
Robert S. Stevenson, president, Allis-Chalmers Manufacturing Co, forecast continuing rapid growth and improved efficiency for the electrical industry. He said, "Gains in efficiency in generation equipment are continuing and will continue, although the rate of gain will not be as dramatic as in some periods in the past. We haven't so much margin left to work on. The trend toward larger stations and to moving the power greater distances at higher voltages has, of course, really just begun."

Stevenson placed particular emphasis on the load-building aspects of the utility business, especially in material handling in industry and in retooling. Pointing out that industry will spend more than $37 billion this year on retooling and expansion, he yet questioned whether the load-building opportunity was being exploited to its ultimate.

Robert R. Gros, vice president, Pacific Gas and Electric Co, explained the local and national benefits derived from the participation of his company in the Trinity River Project (EW, April 8, p 63). He summarized the advantages in terms of a $56-million saving in federal taxes on the initial project; gain in federal revenues of $83 million, and state and local governments' $62 million during the 50-year period.

He pointed out that not one benefit will accrue to anyone outside of California for the Trinity Project. But everyone will help pay for it if the government builds the entire

ROBERT R. GROS, vice president, Pacific Gas & Electric: "The Trinity River project can command economically sound business participation and at the same time provide a $165 million net gain for the government"



P. P. STATHAS, senior partner, Duff & Phelps, proposed that utilities consider convertible debentures as a means of financing in the tight money market. He proposed 5-year non-refundable provisions in bonds

Emphasizes Need for Selling

project. It is, he said, a water project that can be made economic by sound business participation.

P. P. Stathas, senior partner, Duff and Phelps, predicted the money market will continue to be tight as long as we maintain about our present level of prosperity. He pointed out important competition for utilities in the raising of capital. This competition includes the federal and state governments. An additional problem is the current low percentage of government bond holdings of insurance companies which, according to Stathas, do not intend to cut them down any further.

Stathas estimated the supply of long-term investment funds as $22 billion in 1957. The demand is estimated to be $23 billion. This tightness could be aggravated by long-term government financing or helped by a slowing up in general business and an increase in personal savings. But he believes money will continue to be tight. A careful review of capital projects and deferral of unnecessary ones were recommended.

ARIZONA. Mr and Mrs Walter T. Lucking (center) with new Conference Chairman Gordon Evans and Mrs Evans (left) and Mr and Mrs Donald S. Kennedy (right)

First Core Tests End . . .

. . . in experiments aimed at yielding the most efficient design for Con Edison's Indian Point plant

The first series of tests have been completed toward creation of an efficient core design for the reactor of Consolidated Edison Co of New York, Inc.

The announcement was made last week at Babcock & Wilcox Co's Critical Experiment Laboratory near Lynchburg, Va.

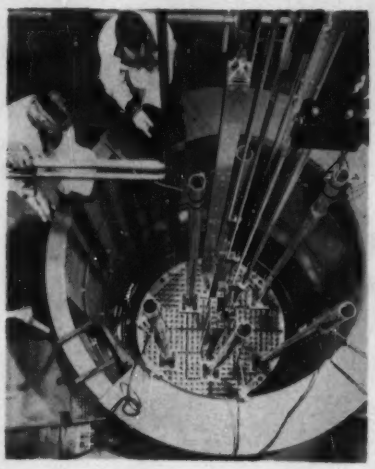
A full-scale experimental version of the Indian Point core was used in the tests—involving controlled fission chain reactions. The core, as licensed by the Atomic Energy Commission, will represent the first use of large quantities of thorium for a nuclear power plant project, said B&W.

Proposed cores for the Con Ed reactor will be studied extensively in critical experiments to obtain nuclear physics data required for the most efficient design, and to determine operating characteristics of the full-scale plant.

5 Safety-Rod Systems Used

Housed in a thick concrete "cell," the experiment has several automatic, built-in safety devices. Among these are five independent safety rod systems which can shut down the reactor in a fraction of a second. Any power failure will operate the rod system through any of four separate electronic channels, B&W reports.

The picture here shows fuel elements, standing on pins on a round grid plate at the bottom of the tank.



Neutron-absorbing control rods are positioned among the fuel elements. Long tubes extending from the grid plate contain various instruments for test and control. When the reactor is operating, the tank is filled with water.

Shippingport: Final-Stage Construction

This is how the atomic power project at Shippingport, Pa., looks today. Construction is approaching the final stage. The pressurized-water reactor, to operate initially at 60 Mw, is slated to begin service late this year. The unit will generate steam at 470F, and 500 psi for power production. Reactor coolant is designed to circulate at 508F and 2,000 psi.

The turbine deck is shown in the foreground. Large building houses the reactor pressure vessel and fuel handling canal. The square building and structures at right comprise the plant's waste disposal facilities. The atom plant is being built for the Atomic Energy Commission, but will be operated for AEC by Duquesne Light Co.

NUCLEAR NOTES

Separate pressure vessels for individual fuel elements will be a radical change to be made, among other design improvements, in Canada's first atom plant. Construction at Des Joachims, Que., has been suspended while plans are being modified.

First firm and complete contract for export of an atomic power unit was signed April 23 by Societe Cooperative Electronucleaire and Westinghouse Electric International Co for a 11.5-Mw pressurized water reactor. The reactor is to supply power to the World's Fair to be held in Brussels in 1958.

Raw materials for nuclear fuels are to be produced at a plant now being built by W. R. Grace & Co at Erwin, Tenn.

A Japanese joint committee believes the Calder Hall (uranium graphite type) reactor is best for power generation, and believes some of the parts of such a reactor could be obtained domestically.

Outcome in St. Louis

Union Electric Co's stockholder meeting late last month attracted a crowd of 270 persons, in contrast to the average 50. At stake was whether new management should be elected, as proposed by St. Louis attorney J. Raymond Dyer. Also up for a vote were 13 of Dyer's proposals ranging from advance board-of-director approval of any lobbying expenditures to establishment of a special office to handle stockholder relations.

Dyer was soundly defeated. Of 10,890,482 common and preferred shares, each entitled to one vote, an unofficial 9,127,000 were cast for management-backed directorship nominees. Dyer, who had been nominated from the floor, amassed an unofficial 20,791 votes—which he claimed was wrong because he said he cast more proxies for himself than that.

All 13 of Dyer's proposals were killed—12 of them by margins of more than 50 to 1. His proposal for advance director approval of lobbying expenditures was defeated 1,491,000 to 1,436,000. On this proposal, management had made no recommendation, nor cast proxies against it unless so instructed by stockholders.

In the Cold North . . .

Despite cold weather, Wisconsin Public Service Corp successfully, and easily, poured a subslab of concrete for the 4-ft-thick floor of its Pullman plant —now being expanded for No. 7 unit.

This was accomplished by circulating a heated salt brine solution through one-inch steel pipe imbedded in a 3-in. subslab below the frost line. The brine solution, with an anti-freeze test of minus 20F, circulated at the rate of 150 gpm. It was heated in the plant's heat exchanger and introduced into the piping at 160 to 170F. It returned at 150F, easily maintaining a working temperature of 45 to 55F.

This obviated temporary housing to prevent frost damage, and kept workers' feet snug.

The Answer . . .

Late in March, engineers at Chief Joseph Dam announced that power production of the ninth generating unit would have to be postponed until mid-April because of a transformer failure. Now English Electric Export & Trading Co, Ltd, makers of the 103-Mva, 230-kv, single-phase transformer, knows what caused the trouble.

A company statement attributes the trouble directly to the "presence of water which led to a turn-to-turn fault in the high-voltage winding after the unit had been in service only a few hours." The trouble originated in a defect in the electrostatic shield in the insulation between H.V. and L.V. windings, the company said. The company already has examined shields of one other transformer, operating satisfactorily, and proposes checking all the other units it supplied.

Water Forecast for West

The U. S. Dept of Agriculture reports summer water shortages are expected to be rather severe in East Colorado and West Kansas. Shortages similar to those of the last two years were forecast for New Mexico and Arizona. But USDA's April 1 snow survey indicates favorable supplies for Montana, Idaho, Oregon, Washington, North Utah, and areas of West Wyoming and Colorado.

More Sound & Fury

Two accelerated tax amortization certificates to Idaho Power Co for its Oxbow and Brownlee Dams on the Snake River have stirred up a flurry of protest from federal power supporters in Washington.

Oregon's Sen Wayne Morse and Rep Al Ullman saw in the Office of Defense Mobilization's issuance of the certificates a "shocking betrayal of public interest," and a "flagrant violation of public trust."

Clyde T. Ellis, general manager of National Rural Electric Cooperative Assn, called the action an "unjustified outrage" that should ensure approval of pending legislation for a federal Hells Canyon Dam.

The certificates allow rapid amortization of 60% of $35.9 million for Oxbow, and 65% of $67.1 million for Brownlee.

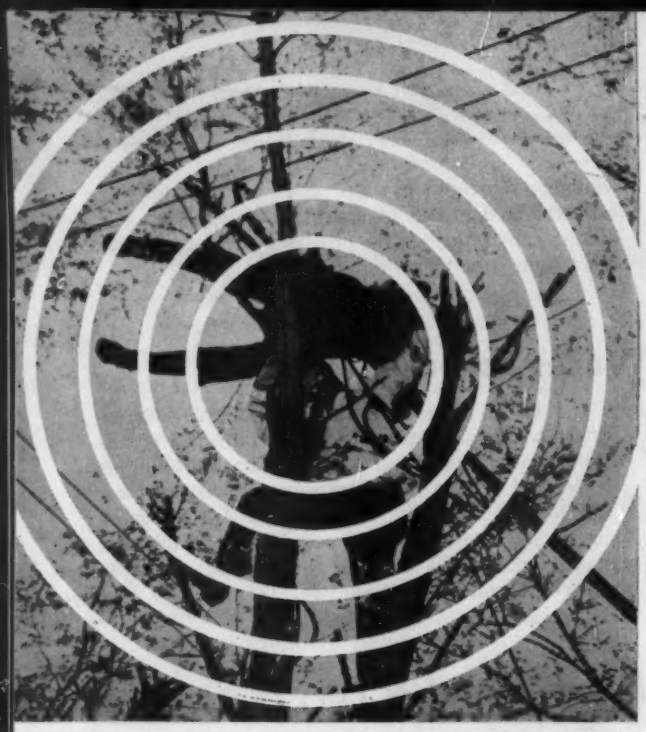
Idaho Power's President T. E. Roach said critics were distorting facts. Accelerated amortization write-offs, he said, are a partial tax postponement and not a "forgiveness."

Sen Harry F. Byrd (D-Va.) said the tax write-off is "utterly indefensible." He said the Senate Finance Committee, which he heads, may try to cancel the write-off "on a retroactive basis."

Perhaps as an offshoot, the Senate Interior Committee approved in secret session a Hells Canyon bill which would authorize the federal government to build a $400-million dam on the Snake River. Voting reportedly was along party lines. Last year the Senate defeated a similar bill 51-41.

Two Bills, but No Action

Alabama Rep Robert E. Jones has introduced two bills in Congress to prevent use of highway trust fund money for utility relocation, and to prohibit states from using federal highway money for paying such costs. But it's unlikely that action will be taken this year on the bills.



Accidents like this are prime targets for the utility troubleshooter—the safety man. Today he's gunning for big game. He's stalking a . . .

Safety Breakthrough!

In the postwar Forties the electric utility industry was embarrassed. Its safety record fell far short of the average maintained by all industry.

Some said the cause could be laid to inexperienced employees—the reckless youth with more confidence than wisdom; the veteran with an emotional hangover from his battlefield days.

As the utility safety record grew worse, it became painfully clear how much was at stake: The working future of too many men in an instant was being changed or written off completely; big money was going needlessly down the drain; bad publicity threatened to reduce the number of desirable new employees available to utilities.

Something had to be done—and it was.

Here's the whole story as related by utility safety directors to EW's corps of field editors and correspondents. Here's why utilities today are on the verge of establishing a better record. Here's why they must—and how they're going to do it.

I. What Is Safety and How Much Does It Cost?

Safety, according to Webster, is "freedom from danger." As applied to electric utilities, safety is a complex subject. It is not an exact science; many aspects are controversial still. Safety sees a constant rubbing of opinion against opinion—from which emerges slowly the polished, widely accepted general rule.

Safety can be gauged by management attitudes, prescribed work practices, and employee enthusiasm. All of those elements are measured by the various barometers of safety achievement.

Two such barometers are these statistical tools: The frequency rate, and the severity rate. The frequency rate is a figure reflecting the number of disabling injuries per million man-hours worked. The severity rate reflects the total number of days charged off to the accident per million man-hours worked.

Other barometers include insurance premiums, credits, and dividends.

For the last few years, the barometers have been reflecting great safety strides within the electric utility industry. In 1956, for instance, the industry racked up one of its best safety records, Edison Electric Institute reports.

The frequency rate dropped to a new postwar low of 6.84—a 10% improvement over 1955. The severity rate fell to 1,384—a 9% improvement. Accidents killed 109 workers in 1956—a decrease of 20%. Lost-time injuries fell to 4,965—a 9% drop. Rural Electrification Administration co-ops managed a 48% drop in fatalities, with deaths caused by electric shock dropping from 19 in 1955 to three in 1956.

The single increase noted was an 11% jump in the number of workers receiving permanent total and permanent partial disabilities.

The improved rates, plus evidences of a multitude of vigorous accident-prevention campaigns, are evoking predictions that the industry is approaching an accident "breakthrough"—the time when utility frequency rates will cut through the curve for all-industry (see chart).

Reaction to the improving accident record already has been dramatic and tangible. After a healthy cut in its frequency rate last year, one West Coast company saved $64,000 in insurance and accident-leave costs alone.

A general manager of a mutual insurance company (which handles compensation claims for a group of more than 65 companies—most of them utilities) says:

"Utilities are enjoying very high credits on experience ratings as a result of their accident prevention programs." The experience rating, based on compensation costs from 1953 through 1955, has meant premium credits of $250,000 a year for one utility with 9,000 employees. All client companies got a 25% dividend on 1956 policies.

Their average cost per case reported last year for medical and compensation was $163 for lost-time and no-lost-time injuries, he said. This includes the reserve on open cases. In 1955, the figure was $253. The manager cautions that these figures fluctuate widely, but do point up trends.

Utilities use another cost index to equate safety expenses for companies of different sizes. It's based on compensation-insurance cost per $100 of payroll. For electric companies in one eastern region, it ran from an average high of $1.04 to a low of 31¢ in a ten-year period.

Measuring costs, of course, is something of a touchy subject. Historically the studies of H. W. Henrich, Travelers Insurance Co, provide the basis for most safety department estimates.

Henrich showed that—generally speaking—for each dollar spent on direct costs (such as insurance, medical care, and settlements) about four dollars should be allotted to indirect costs. But these figure do not necessarily hold for each accident or apply to each company.

Some utility people say Henrich's ratio is too high. An East Coast company evolved a ratio closer to $1 direct to $2 indirect.

Raymond White, chairman of EEI's accident prevention committee and claims and safety manager for Pacific Gas & Electric Co, says indirect costs include but are not limited to:

1. Investigations—time of top supervisors, claims investigators, etc.; **2.** experts' fees; **3.** attorney fees; **4.** employee morale; **5.** work stoppage—production loss; **6.** adverse legislation and punitive regulations; **7.** increase in insurance costs; and **8.** adverse public relations and lack of public confidence.

White says the first five elements are most commonly thought of when indirect costs are mentioned. "The remaining three, though often ignored, can result in some appreciable and permanent additions to company operating expenses," he declares.

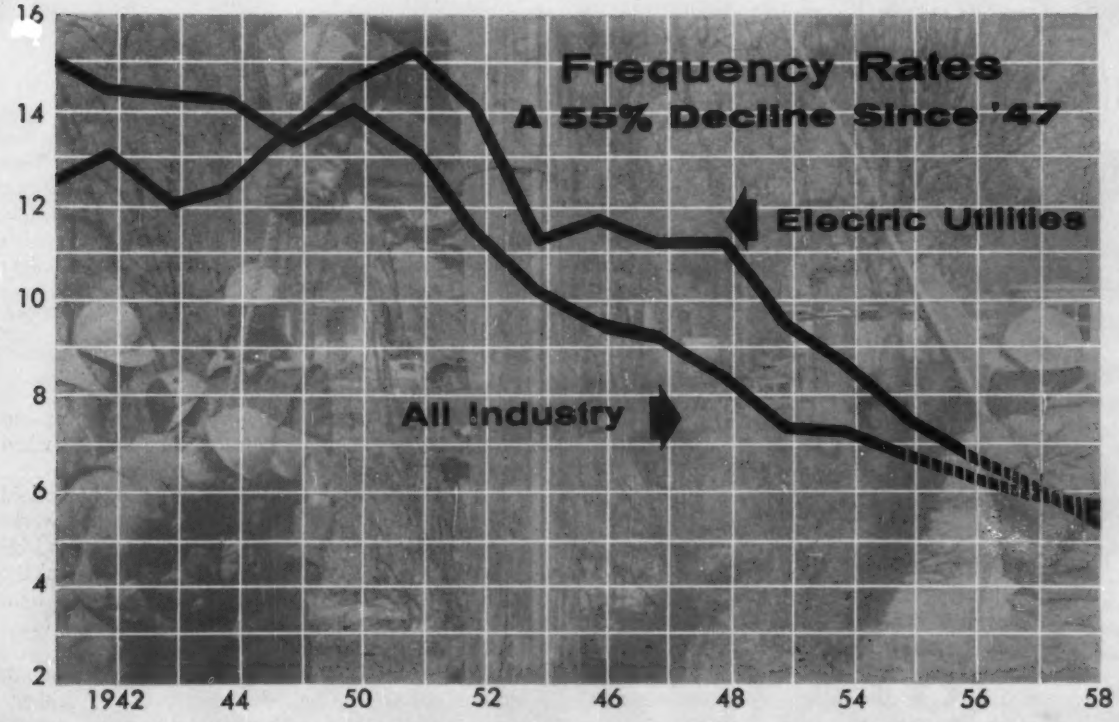
Legislation rammed through on the heels of a disaster, for instance, must be obeyed—often at considerable expense, he points out. It must be obeyed even though the regulations are of questionable effectiveness.

What other costs are involved? Many injured workers get more lost-time pay than the law requires—from two-thirds to 100% of base pay. And lost-time pay adds up:

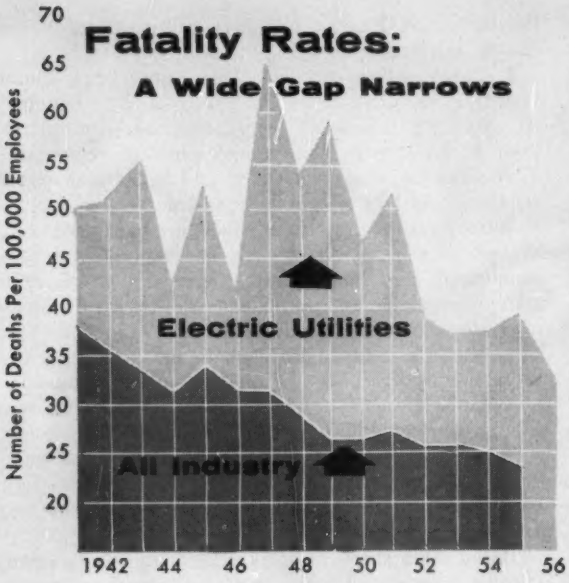
Based on a study of 1954 accidents, one company found it averaged $200 a case above legal compensation paid the injured employee.

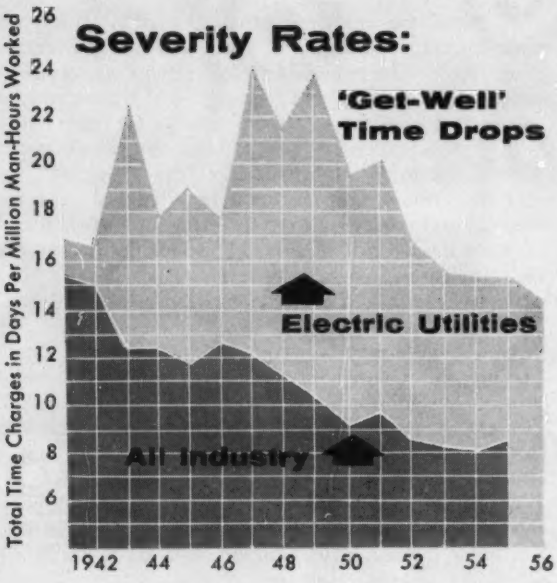
Cutting accident rates becomes highly desirable, therefore, if for no other reasons than financial. "There's no reason why the frequency rate can't be cut in half," says a consulting and engineering firm's safety engineer. "Utilities just have to work a little harder."

Among last year's hard-workers: Wisconsin Public Service Corp (frequency rate: 0.27); New Orleans Public Service Co (0.28); Alabama Power Co (0.94); Southwestern Public Service Co (1.06); Jersey Central Power



Sources for all charts: Edison Electric Institute and National Safety Council. Dotted line above is EW projection.





& Light (1.14); Baltimore Gas & Electric (1.16); and Cincinnati Gas & Electric (1.88).

Management's sincere interest is a safety program essential. One utility president has heartily backed the safety program. The safety director said, "It's become unpopular for anyone in a supervisory capacity to have an unsafe record in his department." Results: Nearly a 65% decrease in frequency last year compared with 1955.

Who has accidents, and what causes them? "Veteran employees have most of them," says one safety director. An analysis of several companies showed men with five to ten years' service had more accidents than the total of all reported cases with five years' service or less.

But one utility reports 50% of all injuries in 1954 hit employees with a year or less of experience. The five-to-ten-year group had only 26% of the accidents. Intensive training subsequently cut the figure to 26%.

Family troubles—sickness or financial worries—may breed accidents, says a Southern safety director. The direct supervisor should be sensitive to his men's moods, and should help through counseling. This approach is paying off in lower injury rates, he said.

Specifically, here's what several companies are doing to improve their safety records . . .

II. Safety Can Be Promoted. Here's How They Attack It . . .

RAYMOND WHITE, EEI accident prevention committee chairman

. . . at Pacific Gas & Electric

When Pacific Gas & Electric Co undertook a searching examination of its program eight years ago, the frequency rate trend had risen year after year since the war. Each successive year since 1949 has shown improvement over its predecessor. Total lost-time injuries in 1956 was only 16% of the 1949 total. The severity rate dropped immediately and sharply. Last year it was less than one-third the 1949 rate.

The credit goes to a hard-hitting campaign on safety following the 1949 review. The program wasn't changed much in form or organization, says Safety Engineer Warren S. Hyde, but implementation was improved. The executive floor underlined safety importance. Responsibility was more clearly assigned. Some highlights:

• **Tailboard briefings:** Before crews tackle a job, briefings by foremen point up hazards and how to avoid them. A reminder is more likely to be applied when it's given just before work starts, PG&E reasons.

• **Demonstrations:** To show how even household voltages can knock a good man down when he's working on hot conductors without rubber gloves, PG&E demonstrates. Workers get the point when leakage through damp leather gloves proves sufficient to light up a bulb. Demonstration mockups recreate other hazards, such as arcing in switching equipment.

• **Meetings and training:** One safety session a month is required for field and physical employees. Accident-prevention themes are alternated with first aid instruc-

E. C. BOOKMAN, VEPCO

J. E. HICKMAN, Los Angeles

F. J. HUGHES, Pacific P&L

tion. Past accidents are analyzed and discussed. A foreman or supervisor is usually in charge. Safety movies are a good opener, but Hyde stresses that it's a mistake to think the gathering must be entertained.

Field practice for pole work takes place in the country. Pole-top resuscitation in town used to attract spectators and occasionally a well-meaning ambulance. Substation men also get on-the-job safety training.

• **Near miss:** Stress is placed on review of accidents which didn't hurt anyone, but might have.

. . . at Baltimore Gas & Electric

New Baltimore Gas & Electric employees receive a handbook describing company policy on safety. They also get instruction on how to avoid accidents. An induction training program emphasizes Safety Engineer R. H. Coleman's theme of getting all employees to think and work safely and eliminate accident causes. When shifted to new types of work, employees are taught safety techniques that apply.

The company's sustained drive has dropped frequency from 4.11 in 1950 to 1.61 last year. Both 1954 and 1955 were below 0.1. Severity plummeted in the past three years when no fatalities were recorded. The standings: 40 in 1954; 67 in 1955; 72 last year. The record has won BG&E the National Safety Council's award for larger combination companies for four consecutive years.

The reason? "We are blessed by having wholehearted management support and participation," says Coleman. "Moreover, there is an acceptance of the safety effort by all levels of supervision. And not only are our supervisors safety conscious; the idea is firmly implanted in the individual workers—which is the group you've got to reach."

Coleman's methods include publishing safety literature constantly for bulletin boards and in employee publications.

One technique involves safety barbecues and oyster roasts for units with accident-free records. The occasions provide a real sense of group participation in compiling a good record, he says.

Another element is encouragement of safety suggestions for which cash awards and company recognition are given.

. . . at Texas Power & Light

A recent "Who Me?" program for Texas Power & Light Co, Dallas, is highly regarded by Safety Director William J. Hanes. It included bulletin-board posters with photos of employees on the job. Each had a "What's wrong with this picture?" peg that piqued employee interest.

TP&L holds weekly safety meetings for discussion of all accidents that have occurred. Pictures of serious accidents, blown up to 30 x 40 in., are shown. The

W. J. HANES, Texas P&L

F. G. HARRIMAN, NEES

W. S. HYDE, Pacific G&E

field man goes over the photo explaining what the causes were. Hanes has made 67 talks to field employees on "What's in It for Me?" He uses a flannel board to describe accident causes, the employee's part, and the company record to date.

Overall effect: Frequency rate for TP&L was 2.28 last year; severity, 617.

Another company in the Southwest trains first-line supervisors in the fundamentals of meeting leadership. Supervisors hold dry-run practices before conducting their own safety sessions.

. . . at New England Electric System

New England Electric System, holding company for more than 20 utilities in five states, emphasizes training, morale, cooperation, and understanding of the job and its hazards. Analysis of accident causes and preventative publicity have helped pull down frequency rates from 13.0 a decade ago to 4.7 in 1955.

Weather is an important factor in the system's accident experience, says Safety Manager F. G. Harriman. Hot summer months require extra precaution to reduce electric shock mishaps. An annual October "No-Accident" campaign conducted for the last 25 years has cut the trend toward increased work accidents usually experienced with winter's approach. This campaign has made October, formerly the worst month, now the best one safety-wise.

Posters are sent twice each month for use on 500 safety bulletin boards around the system. A monthly feature is the "Axidometer Chart" which shows current experience compared with the previous two years. A six-page mimeographed "System Safety Summary" analyzes accident trends, gives statistical standings, and includes tips for supervisors. A general committee and over 60 local committees help carry the safety message down the line.

. . . at Los Angeles Dept of Water & Power

Los Angeles Department of Water & Power holds "Good Housekeeping" contests every three months. Departments are inspected without notice. The program has had definite effect on accident prevention, Safety Engineer James E. Hickman says.

Another push to combat carelessness came in December. An on-the-job drive, supported by posters, the employee magazine, and supervisors, resulted in a 50% reduction of predicted accident potential. Dec. 1 was declared "Safe Driving Day."

Los Angeles' methods for lowering rates include continuous meetings with field employees and department supervisors, and safety slogan contests.

. . . at Virginia Electric & Power

A continuous supervisory safety training program is given credit for Virginia Electric & Power Co's 50% frequency-rate improvement since 1950. And severity dropped from 1,645 in 1950 to 98 in 1956. Observation of crews in the field by the safety department and the correction of wrong work methods are other contributing factors, Safety Director E. C. Bookman says. Competition among districts and departments has created safety consciousness. A neat gimmick is the recent introduction of NOACTO (No Accidents Today) stickers or buttons. These are worn or displayed on unblemished days. Safety meetings, training courses, first aid, and fire drills are other elements of the overall program.

. . . at Pacific Power & Light

Fons J. Hughes, Pacific Power & Light Co safety director, compares the safety program to a continuous sales push that eventually catches on. "After it does, employee enthusiasm helps keep it maintaining itself," he says. PP&L has developed its program as a cooperative endeavor of management, supervisors, and employees. Minutes of monthly meetings provide a checkback for elimination of hazards. A weekly accident-injury summary is sent department heads, district managers, superintendents, and committee chairmen. Prevention manuals are the result of joint IBEW safety committee work.

III. How Can the Industry Hit Its Safety Target?

The industry's future safety breakthrough may well depend upon the success of the safety director in his job. Here's a composite picture of what he should be, as reflected in industry opinion:

- Well backgrounded in engineering, and a superb diplomat.
- A teacher, promotion man, statistician, and public-relations expert.
- An investment counselor. His approach to management should at least include a sales pitch on how much money the company can save through effective accident prevention programs.

As PG&E's White puts it: "Management must be sold —and kept sold—on the idea that the price of safety is less than the cost of accidents. With today's mounting costs, this fact is more than ever deserving of management's consideration."

Age \ Years of Service		½ Yr. or Less	½ Yr. to 1 Yr.	1 to 3	3 to 5	All cases 0-5 yr.	5 to 10	10 to 20	20 and Over	All cases 5-20 yr. and over	GRAND TOTAL
17 to 20	NLT	29	15	8	1	53				53	55
	LT	1	1			2				2	
21 to 30	NLT	42	42	124	93	301	114	3		418	455
	LT	6	4	11	10	31	6			37	
31 to 40	NLT	14	12	41	63	130	158	57	1	346	390
	LT	1	1	6	3	11	26	7		44	
41 to 50	NLT	4	2	21	17	44	48	62	33	187	213
	LT	1	1	1	2	5	8	7	6	26	
51 to 60	NLT	1	3	4	4	12	17	38	44	111	127
	LT					0	1	4	11	16	
Over 60	NLT	2				2	4	6	13	25	26
	LT					0			1	1	
Total	NLT	92	74	198	178	542	341	166	91	1140	
	LT	9	7	18	15	49	41	18	18	126	
GRAND TOTAL		101	81	216	193	591	382	184	109	1266	

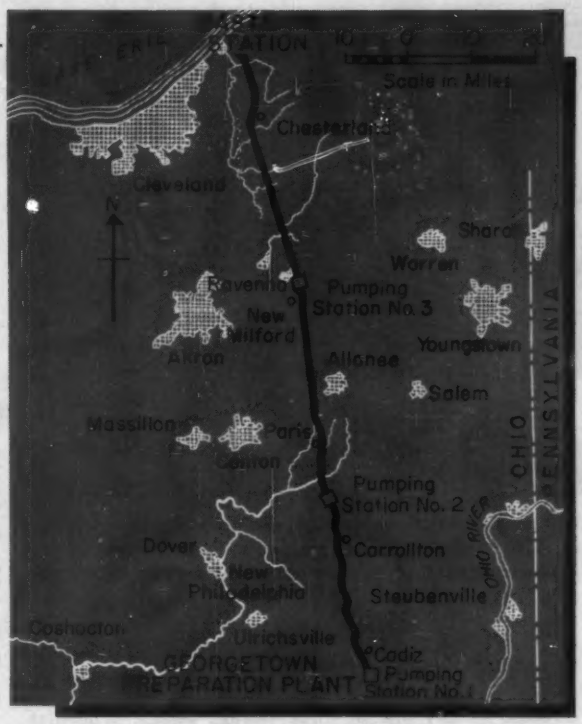
INJURIES HIT HARDEST in group with 5-10 yr service in 31-40 yr-old age bracket, recent study of 1,266 accidents shows

Gilbert Associates, Inc., Reading, Pa.

Coal Pipeline Promises Economy

First coal pipeline in the U. S. will carry 1.25 million tons of coal per year to the 660-Mw Eastlake power plant

C. A. DAUBER, Director of Civil and Mechanical Engineering, Cleveland Electric Illuminating Co, Cleveland, Ohio



Substantial savings in transportation costs are anticipated by hauling coal in a new coal pipeline from the Georgetown, Ohio, mines of Pittsburgh Consolidated Coal Co to the 660-Mw Eastlake station of the Cleveland Electric Illuminating Co.

Total cost of the 108-mile line, including the necessary terminal equipment, will be about $12.5 million. The coal will be pumped as a coal-water slurry from the preparation plant to the generating station where it will be dewatered and dried. Pipeline capacity is 150 tons of coal per hr. It will take the coal 30 hr to make the 108-mile trip.

Magnitude of the project can be appreciated from the following statistics:

- Pipeline will furnish about 80% of the coal burned at the power plant. This will amount to about 1.25 million tons per year.
- Three pumping stations, approximately 30 miles apart, are used. Two 450-hp pumps at each station are required for full-load operation.
- Steel pipe used has 10¾-in. OD.
- Large quantity of water required necessitated damming of an existing lake.
- Project began in 1949 with preliminary investigation of cheaper means of coal transportation by Pitt Consolidated.
- A $2-million pilot plant preceded actual full-scale installation.

There are three main parts to a coal pipeline: The preparation plant, the pipeline including its pumping stations, and the dewatering and drying terminal.

The preparation plant at Georgetown, Ohio, is an ideal site because of the quantities and long-time reserves of coal available at this one location. In addition to an initial pumping station at Georgetown, there are two stations enroute. The second pumping plant is at Carrolton, about 30 miles north of Georgetown, and the third, at Atwater, Ohio, which is again approximately 30 miles north of Carrolton. The dewatering and drying plant is at CEI's Eastlake station.

Main sources of coal at the Georgetown cleaning plant are the fines which come from the Deister tables. Approximately 80% of the coal which will be pumped will be from this origin. The clean slurry from the Deister tables will be pumped to the preparation plant of the pipeline.

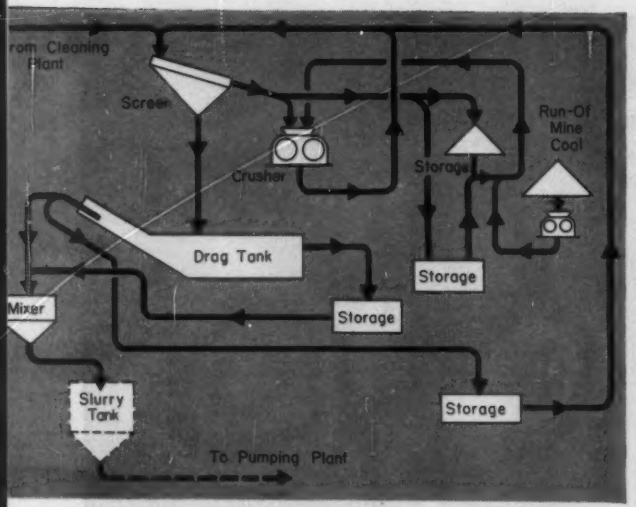
Six Months' Supply of Water Available

The large constant quantity of water required in the transportation process will be supplied from a lake. Capacity of an existing lake was increased for this purpose by raising the dam height. The lake now contains six months' supply.

Principal parts of the preparation plant are crushers, screens, storage tanks, drag tank, and the slurry-mixing equipment. The fine coal, pumped from the cleaning plant, will drop on to screens. The size going through the screens will be suitable for the pipeline slurry, and will pass into a drag tank. The oversize coal will be reduced to the proper dimensions in the crushers or conveyed to a storage pile. The product from the crusher can either be sent to the drag tank via the screens or put in a storage pond.

The run-of-mine coal required to make up the deficiency between total needed and the Deister fine will be crushed and then sent to the first crusher for further reduction in size before proceeding to the

Adapted from a paper presented by the author at the American Power Conference



CAPACITY OF PREPARATION PLANT permits continuous operation of pipeline. Uniformity of slurry is assured by the use of continuous automatic mixing equipment at the site

sizing screens. Coal going through the sizing screens will pass through a 14-mesh screen.

The coal in excess of pipeline requirements can be directed to any one of three storage ponds. The first storage pond will take any fine which overflows from the drag tanks. The second pond is for the excess product from the drag tank discharge. Third pond is for storage of the oversize particles from the screens.

The reason for storing the different sizes separately is to minimize segregation which would occur if all fractions were sent to the same pond. Furthermore, the different sizes can be recombined in the same ratio as existed in the feed to the tank. This arrangement also allows the reduction of the oversize particles without feeding all coal through the crushers.

The storage ponds permit continuous operation of the pipeline when the cleaning plant is out of service. The pipeline will operate on a 24-hr, seven-days-a-week basis, whereas the Georgetown cleaning plant is on a two or three-shift operation, five days a week. As a result, the preparation plant was designed for 300 tons per hr, although the pipeline requires only 150 tons per hr.

To insure the proper slurry concentration the discharge from drag tanks will be processed in a mixer. Automatic equipment will continuously measure the mix and add the proper amount of water.

The slurry from the mixer will be pumped to the suctions of the pumps in the initial pumping station. There are three pump units at each of the three pumping stations. Each unit consists of a reciprocating pump driven by a 450-hp squirrel-cage, motor connected through hydraulic couplings and a speed reducer. Two of these pumps are needed to supply the total requirements of the pipeline. Each will pump 530 gpm of slurry. Pumps are capable of discharging the slurry at 1,000 psig.

The two booster pumping stations enroute are typical of the Georgetown pumping plant except for reservoirs. These stations will have two reservoirs each, one for storing an emergency supply of water and the other for emergency dumping of slurry.

Pumps Have Automatic Speed Control

The hydraulic coupling will insure automatic speed compensation for pump wear. The third pump is a standby for maintenance which will be performed when volumetric efficiency of any pump drops below 80%.

The pumps were primarily built for handling solids and are used extensively in forcing "mud" into oil well drill bits. Provisions have also been made to minimize stoppage of flow. Controls will automatically by-pass any of the booster stations having a power failure and the preceeding station will be adjusted to carry the additional burden.

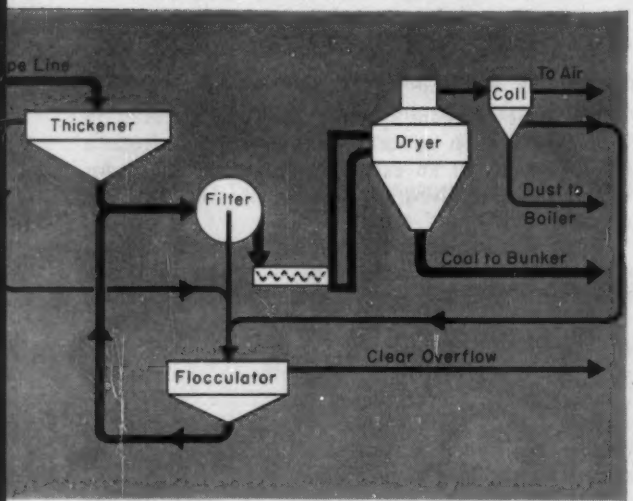
There is a single pipe leading from each of the pumping plants. It is a 10-¾-in.-OD steel pipe with all-welded joints. Wall thickness depends upon the distance from the pumping station. As the distance increases the pressure decreases thus permitting thinner walled pipe. Thickness does not exceed 0.7 in. The entire pipeline is buried below the frost line which is some 4 to 5 ft under the surface.

Inasmuch as it goes over hilly terrain, it was necessary to limit the maximum inclination. If the pipeline were too steep, the coal would have a tendency to roll back even though the water continued on its path.

The time lapse from the point of introduction to delivery will be over 30 hr. Pilot line operation indicated that even if pumps fail velocity of the slurry drops to zero and the coal drops to the bottom of the pipe, it will not compact. The increase in the water velocity caused by partial blocking of pipe by the coal when flow is restarted is sufficient to turn the coal and water into a slurry.

Erosion will not be excessive for the following reasons:

1. Coal will be much cleaner than that normally handled; it is the ash and silt that is excessively erosive.
2. Coal itself has greasy qualities.
3. Erosion will lessen after coal is pumped a short



COMPONENT PARTS OF the system consist of standard equipment that can be found in modern coal cleaning, chemical, water-treating, and sewage-treatment plants

distance because attrition wears off the sharp corners and finally the particles become spherical.

Exterior corrosion of the pipeline is minimized by an enamel coating reinforced with glass cloth. In addition, after a period of operation, the pipeline will be given cathodic protection.

Chemical treatment of the slurry minimizes interior corrosion. Caustic will be added to neutralize the acid solution formed by water leaching sulfur compounds. The dissolved oxygen in the water will be arrested by an inhibitor. In addition, nitrogen will be used in the surge tank heads. The chemicals will be added at the three pumping points because better control will be accomplished by doing it this way rather than at one source.

Two 90-ft-dia Dorr thickeners initially receive the coal from the pipeline at the dewatering and drying plant. The coal falls to the bottom of the thickeners and the water decants over the rim of the tank and flows to a flocculator. This water contains about 100 ppm of solids. The gentle motion imparted to the decanted liquid by the slowly rotating paddles of the flocculator tends to make these solids agglomerate. To assist, an agglomerator will be added.

The enlarged coal particles eventually float out into the outer section of the 85-ft-dia tank and gradually drop to the bottom. The overflow from the flocculator, about 525 gpm, is conducted to a discharge canal of the power plant. The overflow will have approximately 10 ppm of solids.

Dryers Burn 3% of Coal Delivered

In addition to the agglomerator, a chemical will be introduced into the clarriflocculator in order to maintain oxygen inhibitor in the overflow. The plant discharge canal normally has an outflow of 400,000 gal of circulating water per min and will assist greatly in diluting the effluent from the flocculator.

The sludge from the Dorr thickeners and clarriflocculator is pumped to vacuum disc filters. It is estimated that this mixture will be 42% by weight water, and 58% coal. The coal cake formed on the filter discs will have approximately 20% water in it and is still too wet to process in the power plant.

To reduce the moisture further, there are four flash dryers. Each two dryers are furnished warm air from a special furnace. A portion of the coal supplied to the plant, approximately 3%, will be burned in the furnace in pulverized form. The heated gases leaving the furnaces will be tempered with room air and sucked up into one of the two drying columns.

The filter cake is fed into the bottom of the columns and is picked up by the gas being drawn up through the columns. A large portion of the moisture in the coal vaporizes and mixes with the heated gases. The gas and coal mixture from each drying column is directed into a cyclone collector. The heavier coal falls into the bottom of the collector and the moist gases go out through the top. The coal will be reduced to approximately 5% moisture in the latter operation.

The hot gases drawn from the dryer cyclone will be pulled through a second cyclone collector system, and thence to a water washer. The gases will be drawn through the arrangement by induced-draft fans which will discharge into two power plant stacks. The effect of reduced ash in the coal will bring the solids discharged from these stacks down to 65% of what it was previous to use of pipeline coal.

The coal from the initial cyclone separators will discharge to a belt conveyor which will convey it to a 1,200-ton surge bin. The weight of the coal will be measured by an automatic scale forming a part of the belt conveyor system. The coal dust from the secondary collector will be used primarily to fire the hot air furnaces.

At 8-hr intervals, the coal from the surge bin will be fed on to the 1,200-ton-per-hr conveyor system. This system will take the dryer plant coal to the plant coal storage bunkers. The surge bin is required so that the main conveyor system need not be operated continuously.

The product from the pipeline will be very fine. Although coal does have a tendency to agglomerate in large particles as it passes through the dryers, it does not take much pressure to crush the agglomerated particles. Inasmuch as the granuals of coal are very fine, there is no intention, at present, to store pipeline coal. The samples taken from the pilot plant were such that a high wind could blow a large amount away.

The existing 400,000-ton coal pile at the power plant will be maintained for emergency purposes until considerable experience has been obtained on the reliability on the pipeline system. In addition to the storage pile at the plant, there will be 100,000 tons of storage capacity at the preparation plant.

As previously indicated the total cost of the project will be approximately $12½ million. $2½ million of this amount went toward constructing the dewatering and drying terminal.

In calculating what the cost would be to ship coal by pipeline, 15-year amortization was used. All the factors such as cost of money, taxes, insurance, are fully charged. The use factor for the system is expected to be at least 90%. The net result was a substantial saving when compared with the present railroad tariff of over $3.30 per ton from the Georgetown cleaning plant to the Eastlake Power Plant.

What Is the Future of Coal Pipelines?

Transportation of coal by pipeline will be expanded in the future but it will not serve all requirements. In order to be competitive the quantities transported must be large to break even. As pipeline capacity increases cost of shipping per ton decreases because the initial cost and operating and maintenance expenses would not increase in proportion. Furthermore, many of the facilities supplied do not increase as a function of line capacity.

If normal transportation costs are proportional to the distance shipped, the potential savings by pipeline will be greater. The preparation and dewatering facilities are the same regardless of the length of the line. The line and pumping equipment would be the components having increased costs.

If a power plant is built especially to burn the new product, the savings would have been greater than at Eastlake. Some equipment is capable of burning coal from such a line without pulverizing. In addition, the hot air furnaces could be eliminated, if original plans would have allowed use of power plant stack gases in flash dryers.

Manufacturer-Utility Reciprocity

Former should supply air-conditioner electrical characteristics; latter should set up reasonable starting-current rules

P. W. WYCKOFF, Chief Engineer, Airtemp Division, Chrysler Corp, Dayton, Ohio

Manufacturers should furnish utilities with the electrical characteristics of their packaged air-conditioning equipment and, in turn, should expect the utilities to set up reasonable starting-current rules for these products. In this way many interests of the two groups can be reconciled with regard to residential and commercial, single and 3-phase conditioners having cooling capacities above 15,000 Btu per hr (or 1.25 "tons" of cooling).

A typical year-round residential air-conditioning system includes three motors—one compressor motor with a starting current roughly equivalent to that of a 3-hp motor and two motors of ⅓ hp each.

Some manufacturers have 70% of their air-cooled conditioner production in the new units popular for residential use. These are single phase. They are becoming attractive to commercial users and soon may outsell water-cooled units in sizes up to 10 tons and even higher.

Packaged air conditioners commonly found in commercial establishments are water cooled—they discharge the waste heat to a water line. In about 90% of such installations, these conditioners are the 3-phase type. Accordingly, single-phase can be used to describe the air-cooled type; and 3-phase, the water-cooled.

Must Meet Power Needs

As the motor driving the compressor is washed by the cool refrigerant gas, its temperature is relatively low unless it becomes locked or the refrigerant leaks out of the system. The motor must be capable of delivering power which is a function of the compressor displacement and the pressures at the inlet and discharge of the compressor. The higher the displacement, the denser is the inlet gas; the higher the discharge pressure, the greater the horsepower required.

Accordingly, to compare one unit with another, it is important to standardize on certain inside and outside air conditions. Standards of the American Society of Refrigerating Engineers (ASRE) specify techniques of testing and measuring cooling capacity. In the latest standard, 16-56, the temperature conditions established for rating cooling capacity are:

Inside air: 80F and 50% relative humidity.

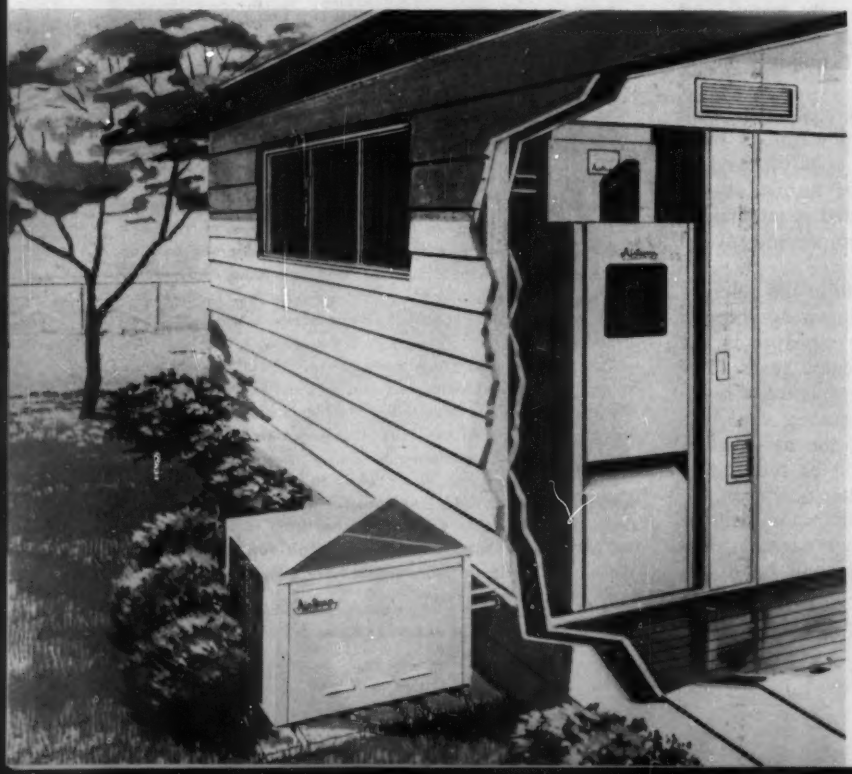
Outside air: 95F and 40% relative humidity.

The Air Conditioning and Refrigeration Institute (ARI) has put out standards, such as 610-56 for residential air conditioners, and 110-56 for room air conditioners, specifying minimum performance requirements. An important provision is the maximum load condition under which the unit must run. For air-cooled conditioners, the conditions are:

Inside air: 95F and 40% relative humidity.

Outside air: 115F and 23% relative humidity.

Voltage: 10% below rated voltage.



Unit Has Three Motors

In such systems, air from the house space enters bottom of gas-fired furnace through ducts and is moved upward by furnace blower past the furnace heat exchanger. Passing the cooling coil, the air moves into the distributing ductwork. After cooling or heating the space, the air completes the cycle by returning.

Apparatus for compressing and liquefying the refrigerant, along with the electric control panel, is outdoors. Two refrigerant lines connect the condensing unit to the cooling coil over the furnace. A year-round thermostat automatically operates the furnace or air conditioner to maintain the desired inside temperature.

This combination is known as a split-type, air-cooled air conditioner. It is called air cooled because the heat absorbed by the refrigerant from the cooled space is ejected to the outside air through a finned coil. The older type, now almost entirely supplanted, discharged waste heat to a city water line.

Is Essential

Nameplate current is not determined in accordance with these standards. It is obtained in accordance with regulations set up by the National Electric Code and Underwriters' Laboratories.

In nameplating a unit, the manufacturer selects the compressor overload, naturally a value permitting the unit at least to run under the high-load condition. The nameplate current is determined from this value after it has been checked by the Underwriters' Laboratories. The ratio of overload trip to nameplate current may be as high as 140%, or as low as 115%, for today's overloads.

Regulations Confusing

The range in ratios is accounted for by confusion in the interpretation of present regulations. Some manufacturers have "inherent" type overloads attached to the compressor. These are sensitive to both current and temperature. As no ruling really covers these units, nameplate current can be chosen almost at will and the tendency is strong to make it as low as legally permissible. Selecting low current ratings avoids oversizing wires and disconnect switches to meet NEC specifications. This procedure conceals technical facts and is no doubt due for radical revision.

Temperature rise is eliminated as a problem because compressor motors are cooled by refrigerant gas. Typically then, the motor is loaded, as shown in the compressor motor performance curve, very close to the breakdown point when it is running under the maximum load condition. Horsepower is no longer a gauge of motor performance.

This loading is of particular interest to utilities, as it decreases the ratio of starting to running current. Most compressor protector devices protect against locked-rotor or loss of refrigerant gas. They are not regarded as running-current protection, as in the case of open-type standard motors.

Horsepower to drive the compressor in a system operating under the ARI high-load specification is a function of system cooling capacity at the ASRE cooling rating condition. This is apparent in Fig 2. Although manufacturers vary, the curve represents present practice and industry sees little chance of substantial changes in compressor and system efficiencies. Spotted on the curve are points reflecting various locked-rotor currents for a single-phase motor. These are taken from Fig 3. A given cooling capacity in a single-phase residential air conditioner, it can be seen, calls for a definite current.

The minimum starting current for a single-phase motor to supply a particular maximum horsepower is shown in Fig 3. This curve is based on data from five major motor vendors, who were asked to assume the best motor design techniques in use or foreseeable. The vendors were asked also to assume that the

Fig 1 - 3 Hp Hermetic Compressor Motor Single Phase 230 V, Capacitor Start and Run

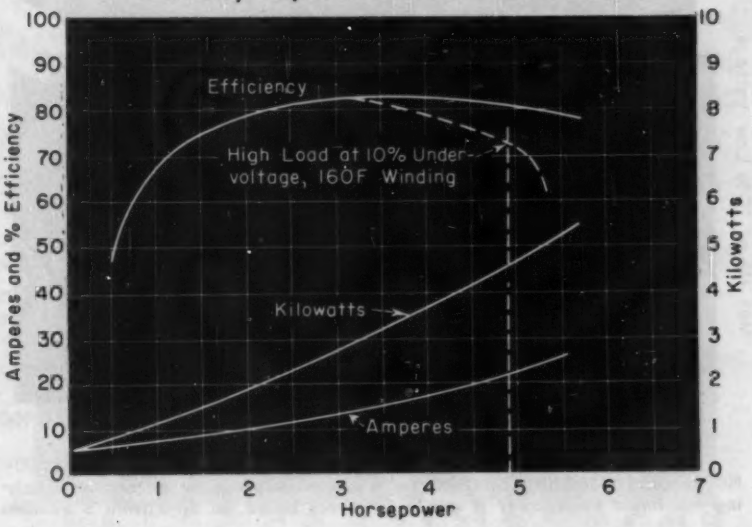


FIG 1—PROBLEM of temperature rise is eliminated, as compressor motor is cooled by refrigerant and horsepower is no longer a gauge of performance

Fig 2 - Maximum Compressor Hp Required Vs Rated Cooling Capacity

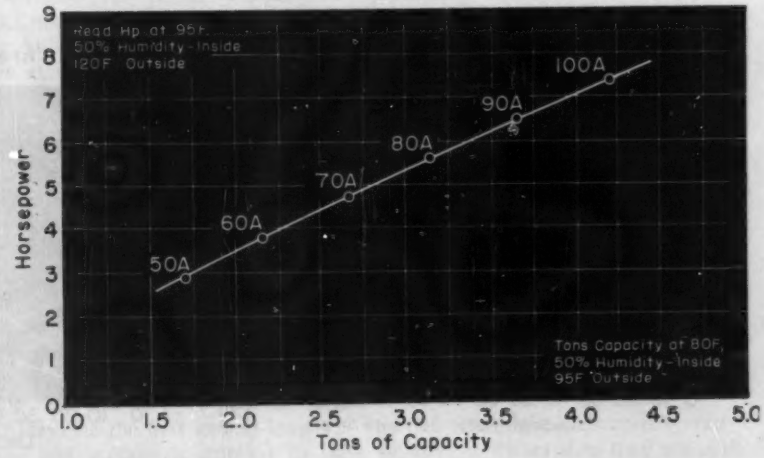


FIG 2—HORSEPOWER to drive compressor in system operating under ARI high-load specification is function of system cooling capacity at ASRE cooling rating

Fig 3 - Maximum Useable Hp vs Locked Rotor Current

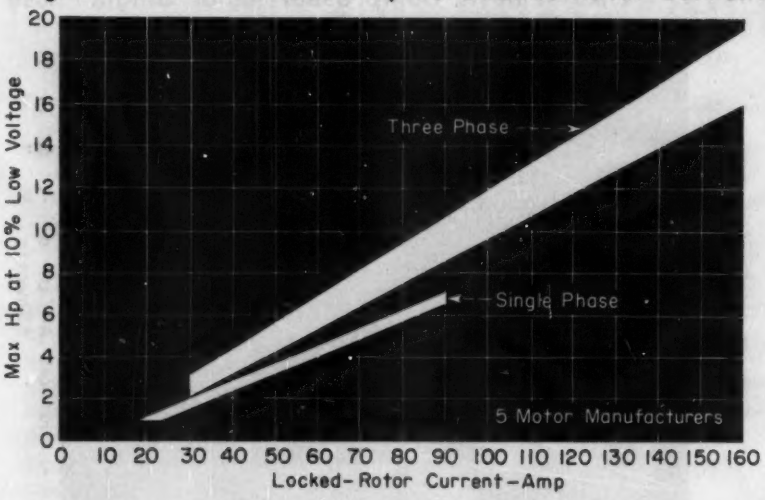


FIG 3—LEAST STARTING CURRENT for a single- and 3-phase motors for supplying maximum horsepower is shown in curves based on data from 5 vendors

compressor was unloaded completely at starting and required practically no starting torque.

As 90% of a single-phase motor's starting current is in the main winding, that current is a function of the motor's maximum horsepower. Fig 3 shows that all five vendors fall in a narrow pattern. Accordingly, appreciable changes in air-conditioner starting current are unlikely in the near future.

In the 3-phase motor, starting current is somewhat more dependent upon the starting as well as on the breakdown or maximum torque of the motor. The range of starting currents is wider among the offerings of the five major motor vendors, although the pattern remains narrow.

Depending on the compressor and type of design available to him,

Fig 4 - Single Phase Air Cooled Units ASRE Current

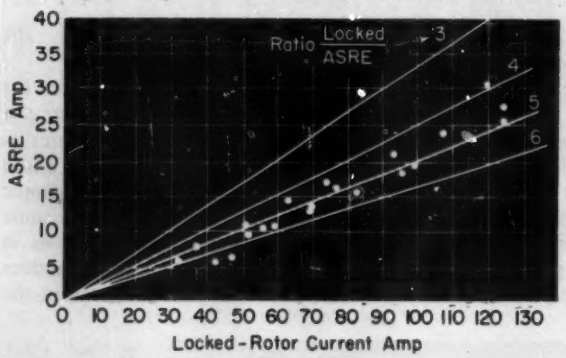


FIG 4—CAPACITIES vary by small amounts. For this reason, various companies use different starting-current values

Fig 6 - Water Cooled 3-Phase Units ASRE Current

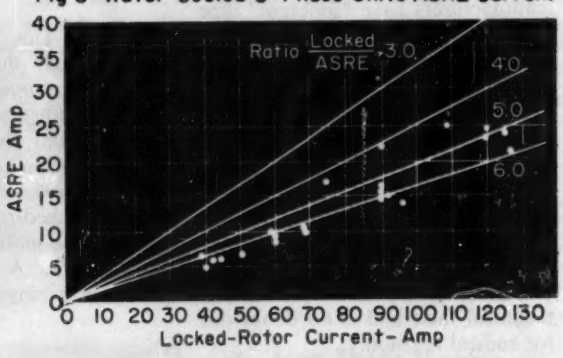


FIG 6—ASRE CURRENTS of 3-phase units show reasonable consistency for both the water-cooled and air-cooled units

Fig 5 - Single Phase Air Cooled Units Nameplate Current

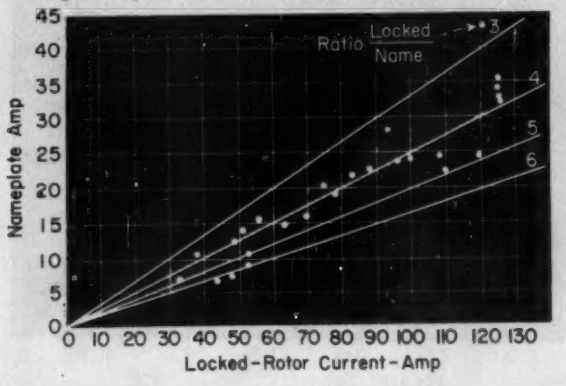


FIG 5—NAMEPLATE replaces ASRE current, stressing the artificiality of procedure in determining nameplate current

Fig 7 - Three Phase Water Cooled Units

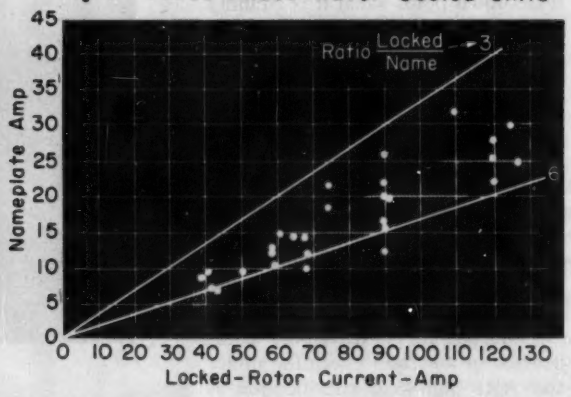


FIG 7—POINTS are widely scattered when water-cooled 3-phase data are plotted on basis of nameplate current

each manufacturer has different ideas on the proper cooling capacity. Below are the cooling capacities in tons of various standard air conditioners now produced by seven manufacturers:

1.73	2.75	3.25	4.85	7.5
1.85	2.76	4.2	5.0	8.67
1.96	2.79	4.45	5.26	
2.0	2.93	4.5	6.6	
2.61	3.0	4.51	6.85	

Vary Minutely

The capacities vary by small amounts. For this reason, various companies use different starting-current values. Standardization on the basis of some fictitious horsepower nomenclature only confuses the picture. The important question is: Does each manufacturer employ a starting current reasonably close to the minimum that he can obtain, considering the running current of his unit?

Fig 4 shows ASRE currents of units produced by 11 major manufacturers plotted against the individual locked-rotor currents. These are single-phase, air-cooled units, whose nameplates show only the compressor currents. In spite of hundreds of variables in the design of a system and the fact that each manufacturer is using his own test facilities, this information falls in a remarkably consistent pattern.

Considering locked-rotor current, few manufacturers have really poor units. But EEI Q-8 single-phase rules, published in 1948, are out of date as they refer only to NEMA open-motor standard practice. The joint EEI-NEMA-ARI Committee is considering bringing these rules up to date.

The same information is shown in Fig 6, except that nameplate current replaces ASRE current. The artificial nature of the procedure for determining nameplate current shows up unmistakably in a much wider scattering of points. For this reason information given to utilities by local air-conditioning distributors can be quite misleading.

The ASRE currents of 3-phase, water-cooled units fall in a reasonably consistent, although not as uniform, pattern as those of air-cooled units, as Fig 6 shows. It is common practice to use the same compressor in both air and water-cooled products. This means a lower loading for compressors in water-cooled installations, even though the locked-rotor current remains the same.

Fig 8-Amp Vs Cycles
Standard Starter Vs 2 Step Starter
Compressor Does Not Start on First Step

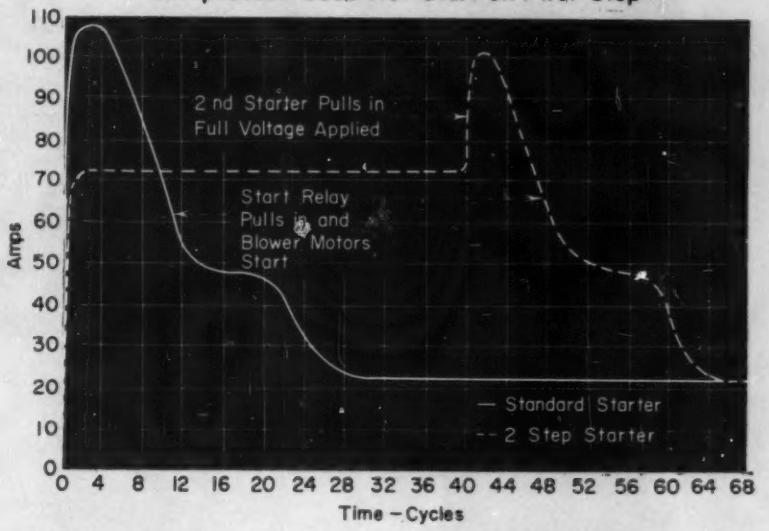


FIG 8—ENVELOPE of current shows two peaks when starter is applied to 4.2-ton air-cooled residential air conditioner. Oscillograph gauges starting current

Points Widely Scattered

When water-cooled, 3-phase information is plotted on the basis of nameplate current, as in Fig 7, the points are very widely scattered. The limits of the EEI 55-8 polyphase starting current rules, issued in August 1955, specify a ratio of locked current to nameplate current not to exceed about 3.9 unless a step starter is used. Such rules eliminate every major air-conditioning manufacturer.

Although appearing to give limits on starting current, these specifications are, in effect, a mandate to add step starters to every 3-phase air conditioner. There has been comparatively little compliance because there are apparently few combined light and power secondary systems and the rules are not being enforced. Utility starting-current rules for air conditioners usually permit an alternative to the approved starting current. Usually this is a step starter for limiting the current on the first, but not the second, step. It stays on the first step at least 0.5 sec and voltage is applied to the compressor through a resistor until the timing period is over. Then the contacts bypass the resistor and the motor operates normally.

Such a starter was applied to a 4.2-ton air-cooled residential air conditioner, and the starting current measured with an oscillograph. The envelope of the current is shown in Fig 8. Many engineers in the industry question whether step starters actually reduce flicker problems. For example, if this curve is regarded as two 73-amp bumps on the line instead of a single 108-amp bump, the flicker curves developed in 1934 would indicate that neither operation would be below the borderline of irritation unless the equivalent length of No. 2 secondary is under 300 ft.

Step Starters Doubtful

Reports from sales organizations indicate that step starters frequently appear to make the flicker problem worse because of the long period on the first step. Generally speaking, an air-cooled air conditioner with 108-amp locked-rotor current does not start when the starting current is reduced to 73 amp by a step starter—at any rate during the summer.

Utilities might well review thoroughly the flicker data they use and bring them up to date, giving special

(Continued on page 114)

UPLIFT FORCES were applied by jacking against a yoke between two adjacent piles. The test pile was driven down 20 ft with a drop hammer and allowed to rest for three days. A hydraulic jack supplied the uplift force

TRANSMISSION—Construction

Test-Pile Field Loadings

A. V. DINEHART, Civil Engineer, Northern States Power Co, Minneapolis, Minn.

Building a 115-kv transmission line over a difficult stretch of flood plain of the Minnesota River, gave Northern States Power Co the opportunity to obtain certain fundamental foundation data by test. Field loadings were made to determine the resistance of timber piles to uplift, download, and lateral loads.

Uplift and download forces were applied to the pile by jacking against adjacent reaction piles. The test pile was driven to an arbitrary penetration of 20 ft with a 3,800-lb drop hammer and allowed to rest for three days to permit skin friction to develop. The download was applied in 5,000-lb increments to a maximum of 40,000 lb and then released in similar stages. Deflections of the test and reaction piles were measured after each increment of loading.

After three days, the uplift force was applied in 1,000-lb increments to a maximum of 22,000 lb and released in increments.

Maximum loads in each case were limited by the strength of the test yoke against which the jacking was done. But the design working loads were of the order of 6,000 lb per leg of the H-frame so that the test loads provided an adequate overload factor.

Download tests showed no settlement of the test pile at 15,000 lb, which means an average skin friction of about 250 lb per sq ft. At the maximum load of 40,000 lb, net settlement was ¼ in.

In uplift, the pile resisted 5,000 lb without moving. The net upward movement of the test pile after being loaded to 22,000 lb was about ½ in.

Structure design provided that each leg of the H-frames be supported by strapping the pole to a cluster of three 35-ft piles, each driven to a penetration of 20 ft and projecting 15 ft above the ground.

To determine the lateral resistance of a pile cluster, a load test was applied by pulling one cluster against an adjacent one. The load was applied with a chain hoist and measured by a dynamometer. Deflections of the cluster from vertical were measured at the ground line, at 7 ft above the ground, and at the top of the cluster where the load was applied.

DOWNLOAD FORCES were applied in 5,000-lb increments to a maximum of 40,000 lb and then released in similar stages. Deflections of the test and reaction piles were measured after each increment of loading was applied

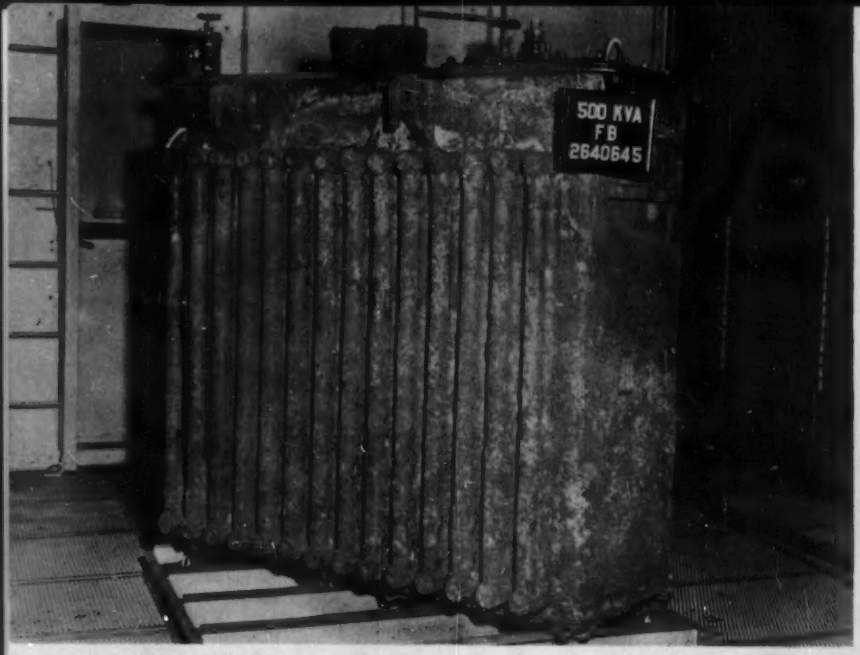
Check H-Frame Settings

Three tests for lateral resistance were made. The horizontal force was applied in 500-lb increments to 3,000 lb and then released in same increments. They showed considerable difference in deflection for comparable loadings, probably because of non-uniformity of soil strata.

In general a 3,000-lb load produced a lateral deflection of about 3 in. at the top of the cluster, 2 in. at 7 ft above the ground, and 1 in. at the ground line. As the load was released, the piles did not return completely to the vertical, probably because of permanent underload deformation of the soil structure adjacent to the embedded portion of the piles. Maximum residual lateral deflection at the top of the clusters was 1 in.

Lateral load tests indicated that vertical piles driven into soft, water-bearing soils have significant resistance to horizontal loads. This resistance was considered in the design of pile-supported structures.

LATERAL LOADINGS were applied with chain hoist, measured by dynamometer. Three lateral tests were made



CORROSION frequently attacks transformers in vaults, especially those below the street. The 500-kva transformer shown here evidences positive signs of deterioration of its tank surfaces after 10 years of operation in a vault

Ally to Combat Transformer Corrosion

DISTRIBUTION
Maintenance

Manufacturers and utilities attack problem respectively through tank surface design and improved vault conditions

A. J. KUTI and R. L. SCHWAB, Westinghouse Electric Corp, Sharon, Pa.
V. A. VEIT, Consolidated Edison Co of New York Inc, New York, N. Y.

Transformers for locations subject to submersion may be protected against future corrosion by either of two programs. One is favored by manufacturers; the other by utilities.

Manufacturers may simplify the external surfaces of transformers to facilitate the application and adherence of protective paint and the protective coatings' subsequent maintenance in limited space. Incremental cost precludes more extensive use of corrosion-resistant alloys in transformer tanks.

Utilities may provide more suitable vault conditions and improve inspection and maintenance schedules within the limits of operating economics. This dual pattern holds the likely solution to a corrosion problem of more than 25 years' standing.

Corrosive agents and media to which transformers are exposed in vaults are many and varied. Some utilities have vaults that are salt-water flooded twice a day by the tides. The inherent corrosive action of salt water on metal is intensified by alternate wetting and drying. Elsewhere industrial wastes of acid or alkaline concentration, street-cleaning chemicals, and snow-removing salts are often present. Water itself and even excessive dampness can be a problem.

Forms of Disintegration Explained

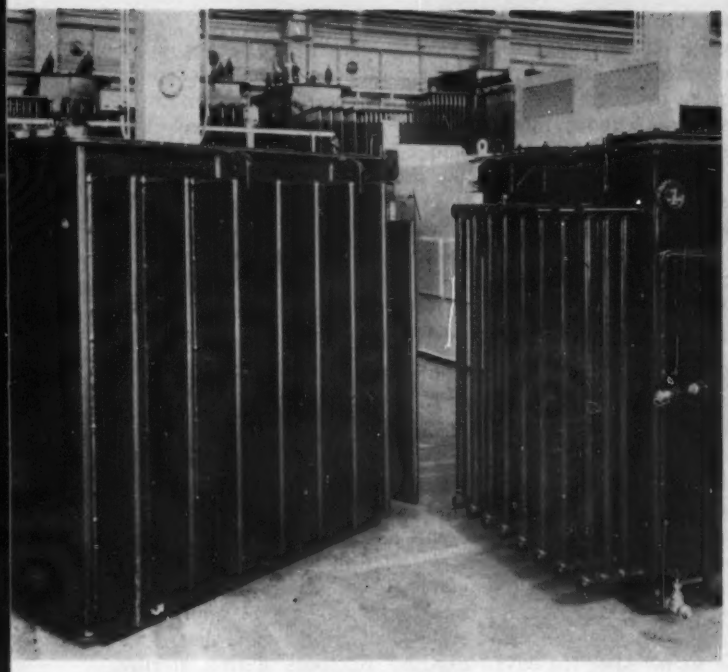
Corrosion denotes destruction of metal by chemical or electrochemical action. The pure metallic state is unknown in nature. Disintegration may be either by the direct combination of metal and non-metallic elements or by the replacement by metal of hydrogen or another metal in compounds. The first form is represented by oxidation reactions, usually more evident at higher temperatures. The second usually involves solution of the metal at anodic areas and the formation of hydrogen at cathodic areas; this is known as electrolysis.

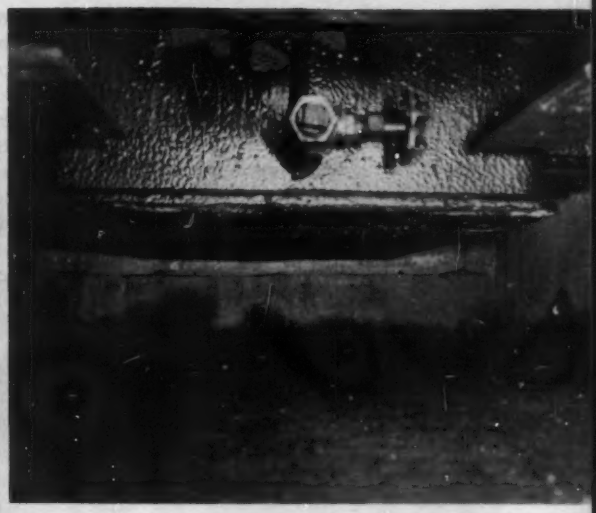
The electrochemical corrosion of metals is related to the position of any specific metal in the sequence known as the galvanic series. Any element in that series is anodic to any element below it in the series and, conditions permitting, a current flows from one element to the other.

As both moisture and oxygen must be present for corrosion, protective coatings are used to retard their penetration into the metal. Any solution of a salt, regardless of amount, is a potential corrosive medium. Any contaminant or debris in contact with moisture forms a solution and, weak or strong, can be classified as a corrosive medium.

For convenience, let us divide methods of protecting against corrosion into two broad categories according to the responsibility—whether that of the manufacturer, or that of the utility.

The manufacturer may reduce corrosion of his products by efficient design and selection of proper materials. In any case the protection gained must be related to the cost of securing it. As in any economic problem, there is a balance to be reached. Thus the most corrosion-resistant material that can be justified economically may be used. The most suitable protective finish may be applied. The design of the tank





FLAT TANK SURFACES, as in the transformer design at far left, facilitate coating, increase adherence of the anti-corrosive coating, and aid maintenance of the vault. Suspension of transformer from vault ceiling, as above, aids flow painting and maintenance

exterior may be made most suitable to the application of coating, as well as subsequent inspection, cleaning, and repainting in the limited space of the vault.

Use of corrosion-resistant alloys is discouraged both by high cost and the possibility of galvanic corrosion between such metals and those in associated equipment. One such alloy would increase the cost of a 500-kva network transformer by nearly 50%.

Present industry standard for network-transformer tank metal is steel containing approximately 0.25% copper. It represents an economic compromise between corrosion resistance and cost. It may be that plastics someday will be the nonmetallic material solution to the tank corrosion problem, but as yet high fabricating and tool expense preclude their use.

Protective finishes may be metallic, non-metallic, or organic. Such metallic coatings as plating, galvanizing, and spraying have this shortcoming; generally, in event of a break in the coating, either the base metal is protected at the expense of the coating, or there is pitting of the base metal at the break. Hot galvanizing gives good film continuity, but the cost of applying it to a 1,000-kva transformer tank makes its use impractical.

Organic finishes are by far the most widely used protection. The susceptibility of inorganic coatings to mechanical damage and their application difficulties seem to preclude their use. Coal tar paints and rubber base finishes are the most efficient in preventing corrosion, and synthetic plastics hold promise.

Installation Method Important

Methods of installing transformers in the vault can be important too. By properly suspending the unit from the vault walls with the bottom several inches above the floor, the advantages inherent in coolers can be realized. Coolers consist of flat, oil-filled fins with smooth contours so arranged that the entire surface of the tank is accessible for cleaning and repainting.

Utilities may well seek these objectives:

1. Select transformers with tanks which can be maintained at minimum cost.

2. Place vaults and equipment where there will be minimum exposure to corrosive elements.

3. Establish a maintenance program which will keep corrosion at a minimum.

Most suitable transformers appear to be:

1. Simple in tank cooler design.

2. Tank suspended or otherwise mounted above the vault floor.

3. Of compact physical characteristics, chiefly low in height.

Suspending the transformer, besides reducing exposure to accumulated corrosive debris, allows easier cleaning, inspection, and repainting. Reduced size facilitates maintenance by increasing working space.

Location of the vault, seldom chosen as most favorable in physical features and far more likely to have been selected for electrical load center considerations, is ever a compromise. Least corrosion is in dry vaults inside buildings. Sidewalk locations have less run-off water and less contaminated drainage than street vaults. Drainage, desirable in all vaults, is not always economically justified. Water is likely to stand for long periods in installations without sewer connections. The larger the vault, the easier the maintenance.

What is a good maintenance program? Periodic inspections to clean out drains, pump away standing water, and flush away accumulations of dirt are important. Consolidated Edison Co of New York Inc, pumps water at about 90 psi from a truck tank to agitate the dirt. The mixture of dirt and water is then pumped into another tank on the truck and, after the solids have settled, the water is useful again. Thus one

charge of water may clean several vaults in one day before the tanks are refilled with fresh water for the next day.

In repainting transformers within vaults, the flow method is perhaps most practical. The paint is literally poured over the tank. The excess paint drains to the bottom of the vault where it is reclaimed for later use. This operation, greatly simplified with suspension-type units, may be done with a shallow pan for collecting the drainage.

When Is a Finish Finished?

Important among maintenance procedures is determination of when the original protective finish has been expended and a new one is needed. This becomes particularly significant for transformers with conventional cooling tubes because of the impracticality of removing corrosion completely in the vault. When protective finishes are shop-renewed, the old finish, corrosion and dirt may be removed by shot-blasting.

Many tests have been devised to determine the relative merits of protective coatings, but individual results are not always conclusive. There can be no real substitute for exposures under exact conditions. It should not be assumed that accelerated tests are without merit, however, for they furnish useful comparisons between coatings and materials used in them.

For submersible equipment Con Edison has a so-called simulated tidewater tester which alternately immerses coated steel panels in a 1% salt (NaCl) solution. Ambient temperature is maintained at 55 to 65C. The panels are lowered into the solution during a 12-hr period and are lifted out of solution during the next 12 hrs. This cycle is repeated until the coating fails. Periodic tests of the electrical resistance of the coatings are made. Nonmetallic coatings with low initial electrical resistance, as well as coatings showing appreciable reduction in the first few days of the test, invariably fail soon. After ten days of testing a sharp cross is made on the face of one of two duplicate test panels and observations continued. Of a large number of paints tested, only a few withstood this test for more than 350 days.

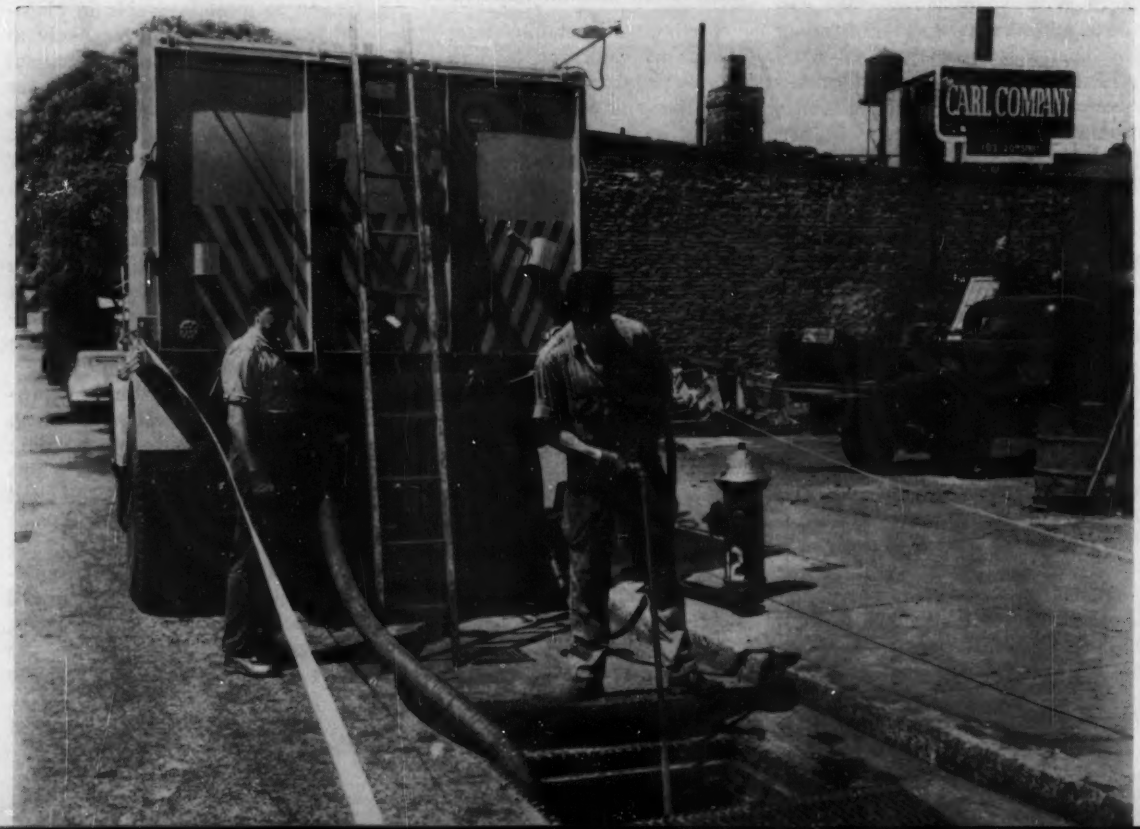
Westinghouse uses an electrocorrosion test. Here, again, a 1% salt solution is used, but copper plates are partially immersed exactly opposite the coated steel plates and a 3-v dc potential applied until the protective coating disintegrates.

Poor coatings blister in hours, normal ones last two days to a week, exceptional films endure a month or longer. A clear correlation between this test and the life of a protective coating appears.

Coal Tar vs Rubber-Base Paint

It is concluded from various checks that metal spray and metal paint combinations deteriorate first. After two-yr exposures, modified coal tar and synthetic rubber-base paints have proved suitable for this service. Both paints have their advantages and disadvantages. Coal tars, although easy to apply, generally "alligator" somewhat when exposed outdoors during storage. The synthetic rubbers produce a harder film and withstand storage well but are difficult to apply, especially by flow methods. Coal tar paints on the other hand have longer shelf life.

MULTIPLE-TANK TRUCK is used by a utility in the improved maintenance procedure for street vault transformers. It permits flushing the vault with water and then re-use of the water during a regularly scheduled vault cleaning up



GENERATION—Operation

Higher Current Densities Increase Brush Life*

R. L. SHERWOOD, Senior Hydro Engineer, Pacific Gas & Electric Co, San Francisco, Calif.

Solutions used by Pacific Gas & Electric Co in obtaining longer operating life of commutators on exciters and collector rings on generators in hydroelectric plants are discussed in this second of two articles.

Part I in last week's issue, noted that the operating life of collector rings is extended substantially by maintaining brush current densities in the 40-to-55-amp-per-sq-in. range, and that electrographitic grades of brushes show longer life than other grades.

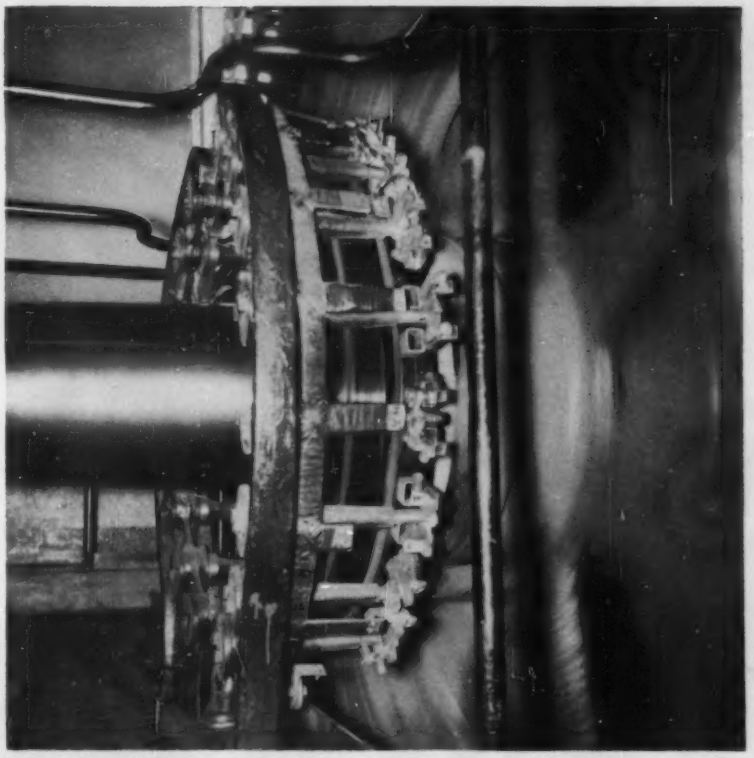
The survey reported last week also revealed that many collector rings, both bronze and steel, were grooved and rough. Brush life on some machines was only two to three months. In some plants, rings were turned or ground once every three or four years as a part of normal maintenance.

To obtain longer operating life, brushes are removed to increase brush current densities. On a 1,000-kw generator, eight of 14 electrographitic brushes were removed to boost brush density to 28 amp per sq in.

Brush life lengthened at least four times, and grooving and cutting of the bronze rings ceased.

On some machines, up to 68% of the brushes have been removed to raise current density to 45 to 50 amp per sq in. The degree of improvement on every machine from which brushes were removed has been from fair to good.

Experimentation with brush removal has progressed slowly as past practice has been to add brushes to collector rings. To date, 35% have been removed from 52 generators.



ENOUGH BRUSHES are removed from the collector ring assembly on a hydroelectric generator to raise the brush current density to 45 to 50 amp-per-sq-in.

At PG&E the survey has increased interest in the operation and maintenance of brushes, commutators, and collector rings. Field forces are measuring brush spring pressures, avoiding the use of long and short brushes on the same brush arm, and cleaning commutators and rings frequently with a canvas pad.

It appears that turning, stoning, or undercutting of commutators is needed less frequently.

It might be noted that an important aid to better collector ring operation is the frequent reversal of ring polarity. As often as clearances permit, at least once annually, this practice is followed.

Investigation of exciters and collector rings disclosed that nonabrasive electrographitic grades of brushes give a much better performance than the graphite or carbon-graphite grades. Two examples illustrate the rather startling improvement in brush and ring operation in many generators.

Brush current density on these machines was 43 amp per sq in. On two 5,000-kw generators, the grade was changed to electrographitic, and brushes were removed to increase the current density to 53 to 58 amp per sq in. Brush life increased four or five times.

Brush grade was changed in 33 exciters. Now all are equipped with the non-abrasive grade. Of 99 generators inspected, 32 already were using the electrographitic grade. The remaining machines are now so equipped.

(More How To on page 70)

* This article is Part II of a two-part presentation of this subject and a continuation of this subject from last week's issue.

NEWEST REASON WHY ALL TRANSFORMERS ARE NOT ALIKE

Molded Covers: now on trial

Unique development represents General Electric's first step toward a molded distribution transformer cover with molded-in bushings to reduce costly service trips.

The improved molding material for General Electric's experimental distribution-transformer covers and bushings is designed to prevent creep tracking—a common occurrence when conventional organic insulating materials are used in contaminated atmospheres. In the photo above Distribution Transformer Department's M. Broverman, Mgr. Design Engineering (left), and W. A. McMorris, Mgr. Advanced Product Engineering, study a completed assembly. The molded parts will be given extensive tests on utility systems this year.

The new molding material is an outgrowth of General Electric's development of molding materials resistant to arc tracking, first introduced by G.E. in the late nineteen-forties for molded instrument transformers.

Present design is only first step

The new molded bushings and covers, representing the first step in this development, utilize newly developed materials to replace steel covers and porcelain bushings. Plans for more advanced molded covers and bushings, however, are already on the drawing board and models are already in Pittsfield testing laboratories.

Next: one-piece designs

Present plans call for eventually molding the high-voltage bushing and the cover in one operation to give one-piece construction. This will reduce the number of openings into the tank.

Cost a major factor

Wide manufacture of General Electric's new molded covers and bushings must wait a few years until resin prices—now on the downswing—reach competitive levels. Then utilities can expect several benefits from G.E.'s new development.

Utilities will benefit

Units with molded covers will need fewer repaintings, since the cover, now the part most subject to weathering, will remain factory fresh. Bushings will last longer—molded materials resist damage better than porcelain. Finally, squirrels and birds will not short out units because the cover itself is an insulator.

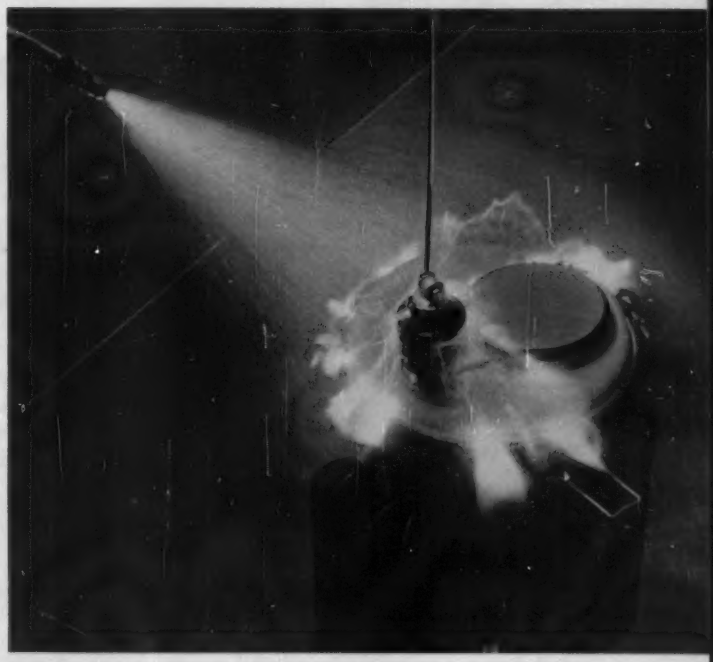
All Transformers Are Not Alike

Continuous engineering development is only one advantage of General Electric distribution transformers. Others include *engineered packaging*, coast-to-coast *warehouse facilities* for fast delivery, *Formex** wire for reductions in tank size, self-protected transformers with new, improved *circuit breakers*, and many others—evidence that all transformers are *not* alike.

For complete information, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to Section 431-53 General Electric Company, Schenectady 5, New York.

*Reg. Trademark of General Electric Co.

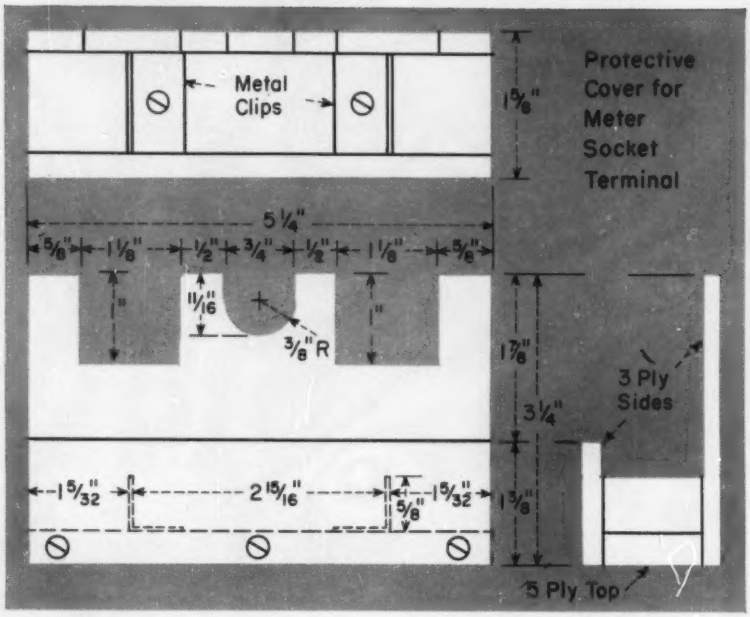
NO MORE TROUBLE WITH SQUIRRELS. New cover is made of non-tracking high-resistance compounds to prevent squirrels and birds from causing line outages, thereby reducing costly service trips.

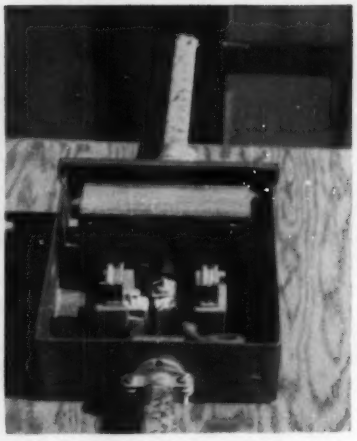


DIELECTRIC TEST. Simulating an electrical discharge during a heavy rainstorm, test subjects molded bushing and cover to wet flashovers of 50,000 volts at 60 cycles. Despite repeated flashovers, there is no tracking and no damage to the molded materials.

Progress Is Our Most Important Product

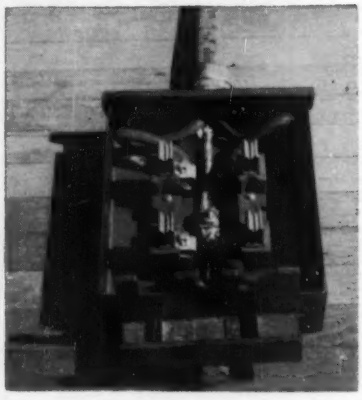
GENERAL ELECTRIC





Shield in Place

Shield Removed



Shield Protects Serviceman

SHELDON M. LAHR, Ohio Power Co, Forest, Ohio

The shield illustrated protects against electrical hazards where connections must be made at the bottom of a meter socket after the top terminals have been energized.

This shield affords more protection than any device or make-shift means known to the author.

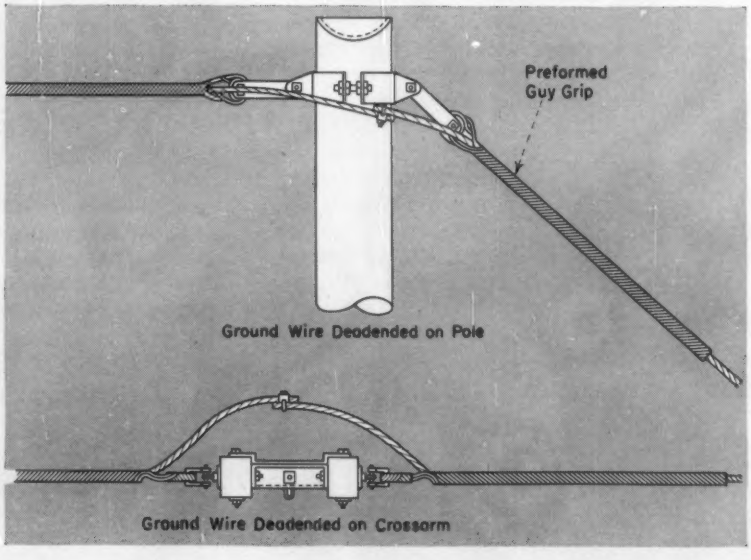
The shield, made of shellacked plywood, is placed over the line-side sockets and pressed so that the metal clips slide into the jaws which hold the shield in place. It covers the socket jaws and their terminals. The device is simple and easy to construct and to use. Its fabrication costs very little.

TRANSMISSION—Construction

Pre-Formed Grips Adopted for Guys

Pre-formed guy grips have been adopted by Wisconsin Electric Power Co for deadending overhead ground wires and making up guys.

The company first tried the grips in 1953 during construction of a 132-kv line, which generally followed the tangents and curves of an old interurban railroad right-of-way. Grips were used for deadending $\frac{7}{16}$-in. EHS, Bethanized C ground wire on H frames, towers, and single poles. Following successful experience with this line, an economic study resulted in their acceptance for all guys.



Recent Regulator Advances call for a Reappraisal of the old question of which to buy . . .

REGULATORS OR LTC?

by D. D. MacCarthy
Manager—Engineering
Voltage Regulator Product Section

Selection of the proper type regulation usually boils down to dollars and cents. Recent improvements in single-phase step regulators, particularly G.E.'s ML-32 with its standard Load Bonus feature (increases current capacity by 60% at ±5% regulation with no loss of short-circuit capability), have changed the economic picture from what we have known it to be in the past.

It should be noted, however, that there is no "pat" answer as to which type of regulation should be used. Application specifications may call for single-phase step regulators, LTC transformers, three-phase step regulators, or induction regulators.

The charts at the right give the new economic picture for Load Tap Changer equipment and pole-type regulators on an equipment-first-cost basis. Additional factors, such as installation costs and auxiliary equipment, might modify this picture somewhat.

Figure 1 represents a 4-kv wye system. It shows that LTC provides ±10% regulation over a broad range. However, on circuits up to 3000 kva of load, the G-E ML-32 single-phase step voltage regulator offers substantial cost advantages.

Figure 2 covers a 12- or 13-kv wye system. Here, again, the same general relationship exists.

These charts show that the General Electric ML-32 single-phase step voltage regulator usually, within its range, offers *by far* the more economical type of regulation.

For more information on regulator economics, write Section 423–24, General Electric Company, Schenectady 5, New York, or contact your G-E sales engineer or agent.

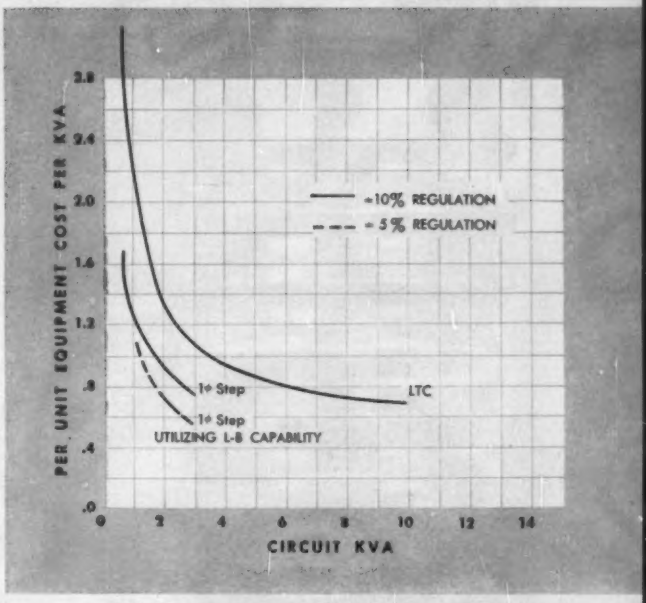


FIGURE 1. Regulating-equipment costs per kva plotted against load on a 4-kv wye-connected system.

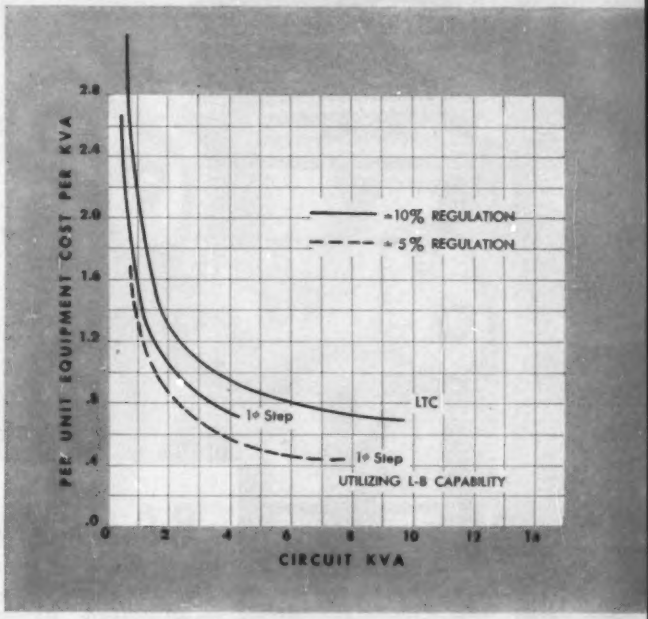


FIGURE 2. Per-unit costs for various regulating equipments on 12-kv or 13-kv wye systems.

Progress Is Our Most Important Product

GENERAL ELECTRIC

RACEWAY TO EXTINCTION

Concentric ring gaps in the new G-E Magne-valve Distribution Arrester whirl the power-follow-current arc to extinction in less than a half cycle, as shown in the high-speed photo above. Rotating action is produced by magnetic flux, as the current flows in coils sandwiched between the gap assemblies. This magnetic action, combined with the valve action of Thyrite* disks, gives Magne-valve distribution arresters their high protective efficiency.

*Reg. Trademark of General Electric Co. for molded resistance material.

Proved Magne-valve principle used on General Electric station and line arresters permits

SMALLEST AND MOST EFFICIENT VALVE-TYPE DISTRIBUTION ARRESTER

The proved magne-valve action has been packed into the smallest, lightest, valve-type distribution arrester on the market today. Some ratings are as much as 40% smaller and lighter than other makes because of the new space saving concentric ring gap design, shown on the opposite page.

Much greater protection is given by these new General Electric distribution arresters—the highest degree of protection ever offered for distribution circuits. The protective level and thermal endurance has been assured by high current tests at 100,000 amperes (5 x 10μs wave), ASA standard duty cycle tests and long duration discharge tests.

Combined valve and magnetic action, of the Magne-valve principle, assures ability to handle lightning discharges with positive extinction of the power follow-current arc after discharge.

Ratings from 3-kv through 18-kv are available in either the external-gap type or direct-connected type with ground-lead disconnector. Both types provide **positive line lock-out protection** and both are universally applicable, anywhere on the system.

For full details on the new line of distribution arresters, contact your nearest G-E Apparatus Sales Office or write to General Electric Co., Section 432-24, Schenectady 5, New York. Ask for Bulletin GEA-6379.

Magne-valve arresters for every application R. W. Frahm, Manager of Marketing—Lightning Arrester and Cutout Section, displays representative samples from the complete G-E Magne-valve line.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Termination of Preassembled Aerial Cable, Shielded Type, 5-Kv, Cu or Al Conductor

Step-by-step methods are presented for terminating shielded aerial cable with either copper or aluminum conductor. The procedures are adapted from Distributon Standards of New England Electric System

Procedure for Terminating Copper Conductor in Shielded Type Cable (Fig 1)

1. Unwrap metal tape proper distance. CAUTION: Do not cut any outer layer by pressure toward cable insulation. Slip sharp blade beneath lapped edge of metal tape and cut away from insulation. Cut metal on bias and make edges smooth and flat; remove burrs.

2. Strip conducting tape to within 0.5 in. of metal tape.

3. Pencil factory insulation at cable end. Finish smoothly.

4. Seal bare copper strands at conductor end by tinning.

5. Clean exposed factory insulation with benzine.

6. Roughen exposed surface of factory insulation between points X and Y with smooth rasp (shoemakers') and apply coating of rubber cement, allowing to dry until tacky.

7. Build up insulation by applying half lapped rubber splicing tape to 0.25 in. thickness. Tape shall extend 2 in. over the metal and 2.5 in. over insulation.

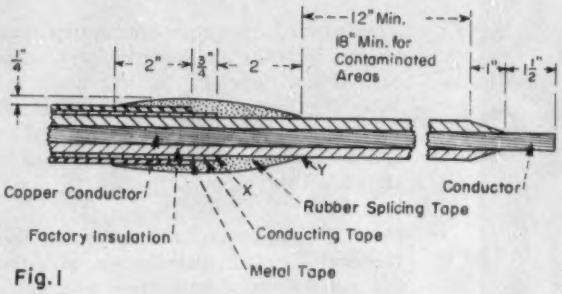


Fig. 1

8. Avoid bends; cable from ball to cable end shall be straight with no supports.

9. Applying tape; do not reduce 0.75 in. tape to less than 0.5 in. and 1 in. to less than 0.25 in.

Procedure for Terminating Aluminum Conductor in Shielded Type Cable (Fig 2)

1. Insert copper conductor into reducer end of connector and compress.

2. Cut copper conductor to proper length; seal copper strands by tinning and insert into switch to properly position reducer connector with respect to switch.

3. Train aluminum conductor into position and cut to proper length.

4. Unwrap metal tape proper distance. CAUTION: Do not cut any outer layer by pressure toward cable insulation. Slip sharp blade beneath lapped edge of metal tape, and cut away from insulation. Cut metal on bias and make edges smooth and flat; remove burrs.

5. Strip conducting tape to within 0.5 in. of metal tape.

6. Pencil factory insulation at aluminum cable end. Finish smoothly.

7. Place Penetrox in aluminum end of connector, insert aluminum conductor, compress and wipe off excess compound.

8. Clean exposed factory insulation with benezine.

9. Roughen exposed surface of factory insulation between points X and Y with smooth rasp (shoemakers) and apply coating of rubber cement, allowing to dry until tacky.

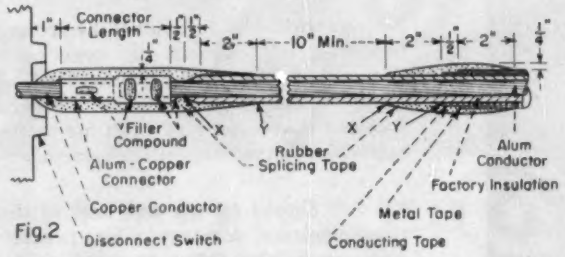


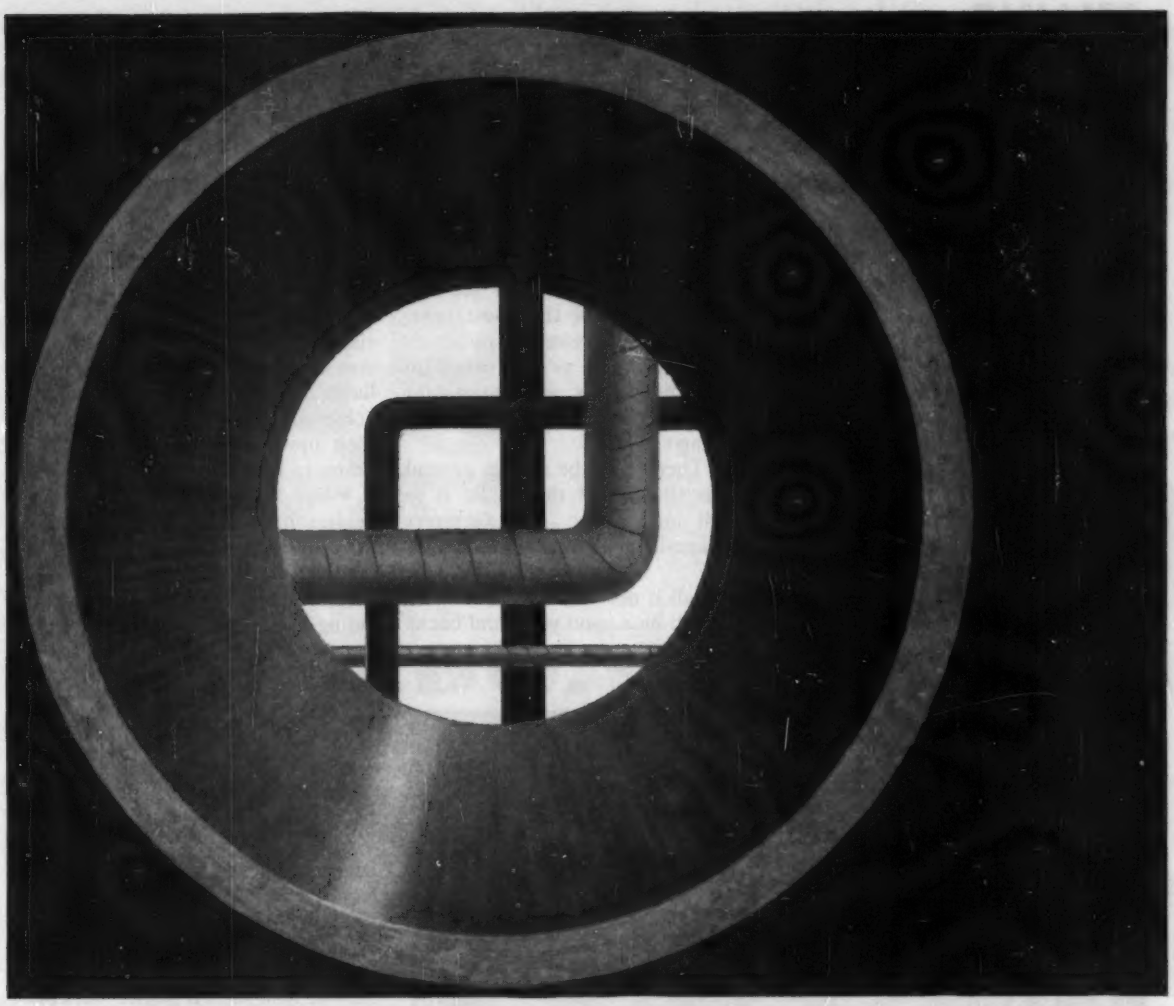
Fig. 2

10. Fill indents and voids with filler compound.

11. Build up insulation by applying half lapped rubber splicing tape, over connector and end of metal tape to 0.25 in. thickness. Tape shall extend 2.5 in. over factory insulation and 2 in. over metal tape.

12. Avoid bends; cable from ball to cable end shall be straight with no supports.

13. Applying tape; do no reduce 0.75 in. tape to less than 0.5 in. and 1 in. to less than 0.75 in.



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Plicoflex® Tape Coating, revolutionary new pipeline wrapping developed by Plicoflex, Inc., combines the outstanding protective properties of Enjay Butyl Rubber with the identification properties of a color-bearing plastic film to which the Butyl is laminated. Applied over an Enjay Butyl based primer and forming a permanent bond to the metal, the tape features: absolutely *no* moisture migration or penetration; exceptional resistance to shock-impact; excellent dielectric properties, and outstanding resistance to normal and unusual corrosive influences. This *cold-applied* wrapping is *safer* and *cheaper* to apply by hand or machine than hot coatings and requires fewer personnel.

This is still another in the steadily growing number of products developed with Enjay Butyl Rubber. Contact the Enjay Company for complete information about this truly *wonder* rubber . . . where it can help *you!* Complete laboratory facilities, fully staffed by trained technicians, are at your service.

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'56 Appliances: Sales Up—Profits Down

Hotpoint Co president points up paradox which benefited public in '56. Manufacturers must find a middle ground for long range benefits

The year 1956 may go down in appliance history as one of paradox. 1956 set a new high for total major appliance sales, and at the same time, showed the lowest profits, generally. That's the gist of a article by John C. Sharp, Hotpoint's president, writing in a recent issue of NARDA News.

Sharp goes on to make three points about the situation:

1. It is a hazardous one; more money should go into research, development and improved facilities.

2. The public received the immediate benefit of this most competitive of all years. Appliances were better, and as contrasted to other commodities, were priced far lower by comparison than a few years ago.

3. There must be middle ground in this situation if the public is to benefit long range. Manufacturers are already beginning to recognize this.

But all is not lost. Sharp believes 1957 will be a good year, and backs up his viewpoint with statistics:

- Personal income, GNP, marriage and birth rates are on the increase. These are all standard, reliable market indicators. They have achieved a certain "momentum" in their upward swing, and there is a desire to keep them rolling.
- The lack of success by a few dealers has been allowed to color the general picture . . . "In our competitive economy, there are those who are coming up when some are fading."

GE's Cordiner Lights 100-Yr Lamp

Ralph J. Cordiner, president of General Electric Co, is shown turning the key to light a lamp expected to burn for more than a century. The bulb, a replica of Edison's first practical lamp, is in the lobby of GE's Research Laboratory at Schenectady, N. Y.

It was built by Nela Park as a forward-looking symbol, but "is no bargain in actual light-output-per-penny when compared to the efficiency of ordinary bulbs", according to Dr Guy Suits, right, GE vice president and director of research.

With Cordiner and Suits is Dr William Coolidge, director-emeritus of the lab and keeper of one of the keys for the lamp. The other key will go to Nobel Prize-winning Dr Irving Langmuir.

AHLI Opens Member Drive

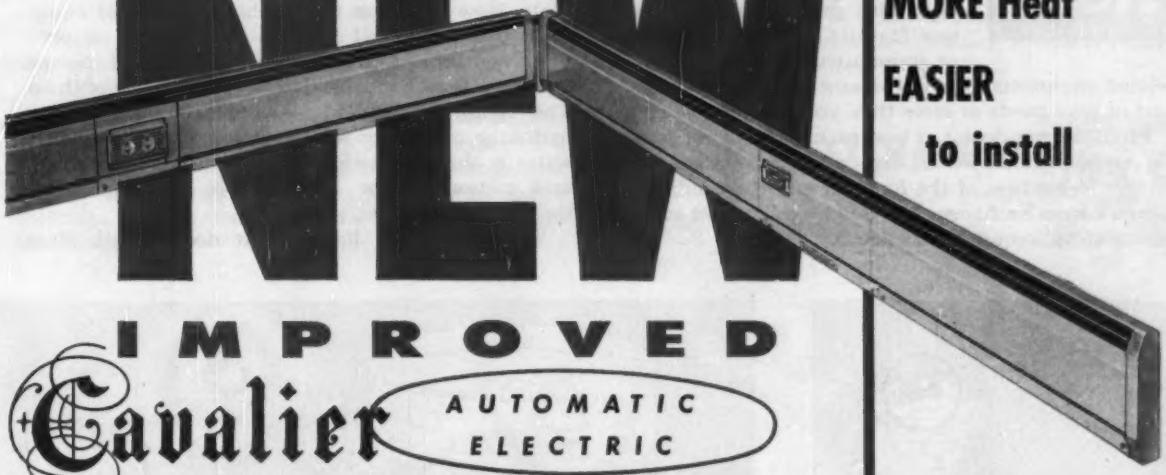
American Home Lighting Institute recently kicked off a nation-wide drive to recruit home lighting fixture manufacturers. Memberships are being opened up to the country's 2,400 distributors as part of an effort to boost the sale of residential lighting fixtures by some 400% by 1961. AHLI feels industry-wide support is needed if fixture sales are to maintain their record pace despite the drop in new-home starts. Sales were upped 18% in 1956.

Pitchfork to Sales Pitch?

That gregarious soul, the salesman, may soon be in short supply. At least that's the opinion of National Sales Executives, an organization that warns us that unless we channel half a million sales people into the nation's market and distribution facilities within the next year, the numbers in the cash register will go down. As a result, NSE has gone down on the farm to plant a few seeds of its own. Campaigns to catch the farm boy's fancy are already in the making: films, slides, literature and success stories are among the tools being used.

(More Selling on page 80)

NEW



NEW Air Flow

MORE Heat

EASIER to install

IMPROVED Cavalier AUTOMATIC ELECTRIC BASEBOARD

The finest heat and simplest system you can install!

Treat your customers to **true perimeter heat** . . . balanced warmth for real comfort everywhere in the room at all levels.

Cavalier Baseboard heat is gentle. Maximum surface temperature never exceeds 125°F, yet **heating output is stepped up to 200 watts per lineal foot.** Thus, fewer sections are required to maintain optimum room warmth.

Save labor and material with Cavalier's new construction advancements. **Sections interlock for quick installation.** Only two screws for 32" or 48" section required to fasten to wall. And, special thermostatic control sections build in with baseboard to save wiring costs. No carpentry needed . . . Cavalier baseboard installs on wall surface, requires no recess. Cavalier baseboard heat is simple and simply the finest in heating. Investigate Cavalier's many salesmaking, time-saving features.

NEW Improved Air Flow design provides better distribution and circulation of heated air. Cool air enters at bottom of baseboard and is channeled over and around the heating element. Heated air is thrust out and away from the wall.

INDIVIDUAL ROOM TEMPERATURE CONTROL
Built-in thermostatic control keeps each room at exact temperature desired without affecting heat in other parts of the house. Simply plan the built-in control at a convenient point in the baseboard—save labor and a run of wire across room to a wall thermostat.

TOPS IN EFFICIENCY! Cavalier Baseboard installs at floor level along weatherside walls where it's needed most. Takes advantage of natural rising of heat—no cold drafts, no hot spots. Completely automatic. No moving parts —nothing to wear out. To win satisfied customers, install Cavalier Baseboard!

Write for the newest catalog on Cavalier's complete line of Electric Heating Equipment.

CAVALIER CORPORATION
Electric Heating Division, Chattanooga, Tenn.

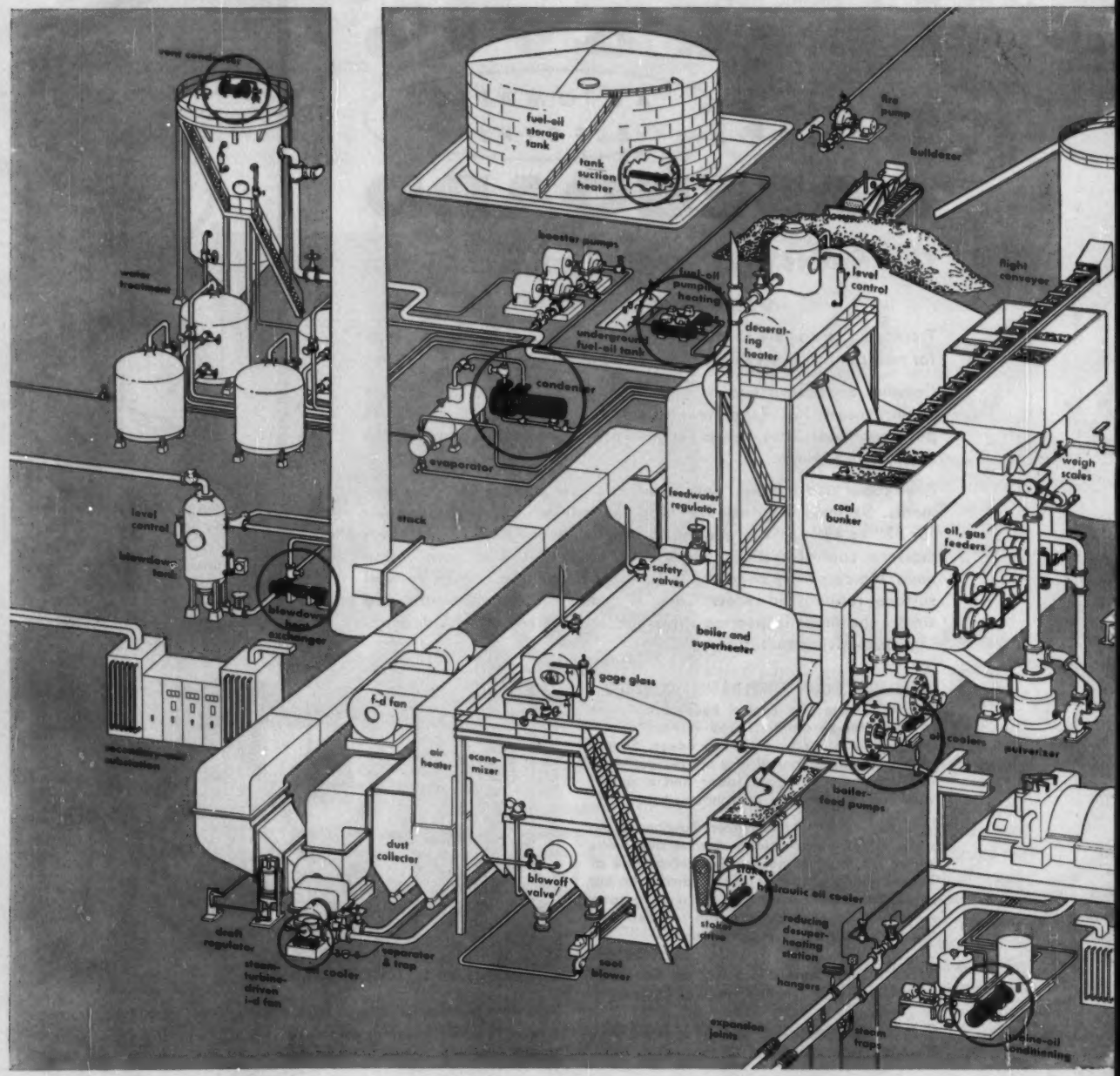
Two ways to extra freedom in room arrangement. Place furniture anywhere; it cannot interfere with Cavalier's Baseboard heating. Build in all the convenience outlets wanted (Duplex 115V)—helps decorating!

ROSS Exchangers and Condensers perform

This layout of a modern steam power plant could be yours today or a blue print of your future one. It could be a central station or an industrial plant. The interrelated equipment could represent all of your needs, part of your needs or more than you need.

From the standpoint of heat exchange and condensing equipment, however, this one fact stands out firmly: Regardless of the function and the condition, there's a Ross Exchanger and Condenser to meet *every* power plant requirement. See for yourself. Surface Condenser? It's there. Feedwater Heater? It's there. Blowdown Exchanger? It's there. Fuel Oil Heater? It's there. Now look over the machines and other equipment that require oil cooling — the Diesels, air compressors, turbines, transformers, boiler feed pumps. There's a Ross Exchanger to serve every one of them. The compressor cylinder-mounted intercoolers, the hydraulic oil coolers for the stoker drive, the jacket water coolers for both engines and compressors, the tank suction heaters . . . on it goes from one end of the plant to the other.

Where does the list end? It doesn't with Ross.



numerous services in the modern steam power plant

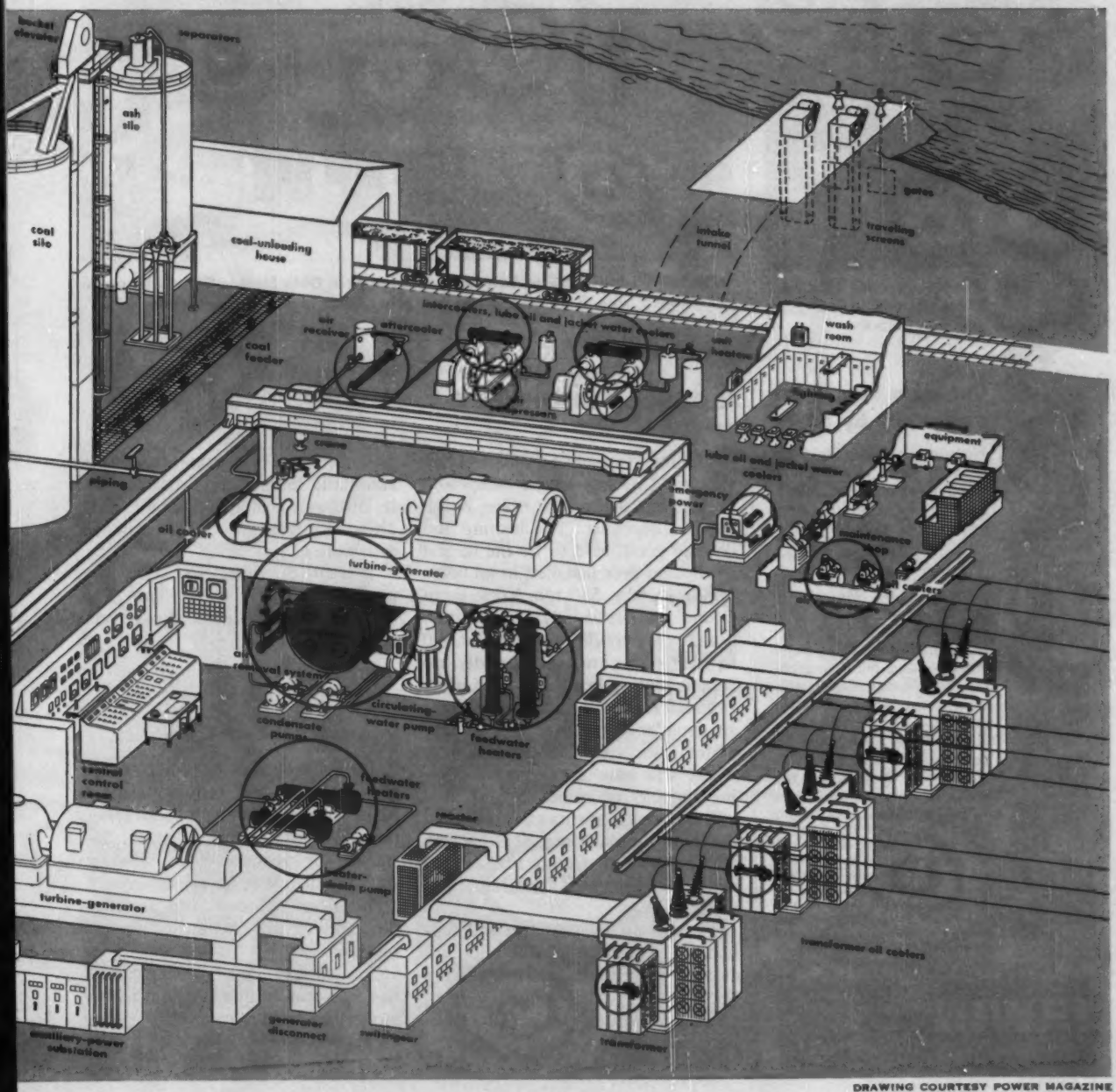
Standard or special, primary equipment or machine components, large or small, one of a kind or dozens alike, Ross Exchangers and Condensers are designed and built for optimum performance in every type of service within the modern steam power plant.

And of this you can be sure: A Ross engineer, in consultation with yours, not only has the most to offer in the way of equipment, but the most in experience, too. The name Ross is renowned in the power generation field — utilities, industries, institutions, major buildings, engineering and contracting firms throughout the world.

Complete literature on specific products will be mailed promptly at your request. Write: Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

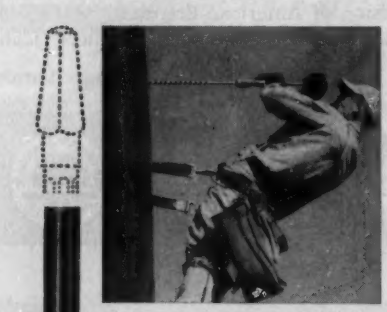
Division of AMERICAN-Standard



DRAWING COURTESY POWER MAGAZINE

New adapter shank bit

fits either hand brace or power drill



Taper square shank fits hand braces

Cut off taper and use "hex" shank in both power drills and hand braces

Cut your wood bit inventory by 50%

Now you can eliminate the need to stock two types of wood auger bits. Irwin's new Adapter Shank Bit fits both hand braces and power drills.

With hand braces, use the Adapter Shank Bit as it comes. Cut off taper square and the Adapter Shank, with its 6 "hex flats", chucks perfectly in power drills or hand braces, either one. No wobble, no run-out. Clean, efficient cutting action. Reduces inventory and record keeping by 50%. Saves time on the job, too. Call your distributor, or write today for complete information. Sizes 4/16" to 17/16", both solid center and single twist types.

***All Irwin Adapter Shank Wood Bits** are forged in one piece from special steel and heat tempered full length for longer life. Plastic coating on balanced cutting heads guarantees factory-fresh sharpness, unequalled performance. Widely used by utilities, electricians and construction workers.*

IRWIN auger bits • screw drivers

Wilmington, Ohio

NEW OFFICE BUILDING of Columbus and Southern Ohio Electric Co will be space conditioned with a 550-ton air-source heat pump plus six special-area units

C&SO Building to Get Giant Heat Pump

Columbus and Southern Ohio Electric Co is putting a mammoth heat pump in its new office building in Columbus. The heating and cooling giant, said to be the largest of its kind ever installed in an office building, is a 550-ton York compound compression air-to-air unit. It will space condition some 180,000 sq ft of office area. Reportedly, no supplementary heating will be used.

In addition, the building will have six smaller air source heat pump systems located in the penthouse. These will have an aggregate cooling capacity of some 75 tons, and will be used to air condition special parts of the building, such as the auditorium and display areas. They will also produce domestic hot water.

Outside air temperature will regulate the heat pumps' operation. A data center provides control, making the systems go automatically from cooling to heating and back to cooling again.

Peripheral office areas will have high pressure induction units for automatic temperature control. Interior zones will get their air conditioning from a high pressure distribution system.

Ebasco Services, Inc, are the project's engineers and builders. The building is scheduled to be finished in early 1958.

Room A.C. Every 45 Secs.

East Springfield, Mass., plant of Westinghouse is turning out a "Streamliner" room air conditioner once every 45 sec. The unit is designed for in-the-wall or window installation. Westinghouse says a conventional window-type air conditioner can also be turned out at the same rate.

The completion of the air conditioner assembly line tops off a 3-yr modernization program.

(More Selling on page 83)

NEW K-BAN PENTA POLE BANDAGE

CUTS COST OF GROUND-LINE PROTECTION

Clean, easily applied K-BAN provides Penta protection . . . always ready for quick application wherever needed

TEAR-STRIP adds to K-BAN convenience. Bandages are available in sizes to fit all poles.

OPENED BANDAGE is wrapped around pole and stapled in place, top edge 2" above ground line.

COMPLETED TREATMENT looks like this. Shovel, wire brush and ruler are only tools needed.

New K-BAN is a pole-saving ground-line bandage designed for easy, fast, clean application. It is completely sealed, ready for instant use.

Inside the tough plastic-coated kraft paper backing is POL-NU, a grease-type protective compound containing 10% PENTAchlorophenol. Water soluble, highly toxic sodium fluoride is also incorporated in K-BAN as an added feature. When wrapped around the pole at the ground-line, K-BAN provides a reservoir of preservatives which work into the wood to prevent decay and termite attack in this vulnerable area.

K-BAN bandages are low in cost and far more economical to use than conventional methods of ground-line preservative treatment. They give many years of extra pole life, cutting maintenance and replacement costs. Send coupon below for price list and additional information.

PROTECT OLD POLES, CHANGE-OUTS AND DAMAGED POLES WITH K-BAN

Make K-BAN Bandages standard equipment with all line crews

K-BAN—Trademark of Forestry Enterprises, Inc., St. Paul, Minn. Patents pending.
POL-NU—Registered trademark of Chapman Chemical Company, Memphis, Tenn.

CHAPMAN®

CHAPMAN CHEMICAL COMPANY

Leading manufacturer of wood preservatives

Memphis 1, Tenn.

Minneapolis, San Francisco, Portland, Ore., Charlotte, N. C.

Mail for K-BAN prices and data

Chapman Chemical Company
P. O. Box 138, Memphis 1, Tenn.

Please send prices and additional information on K-BAN to:

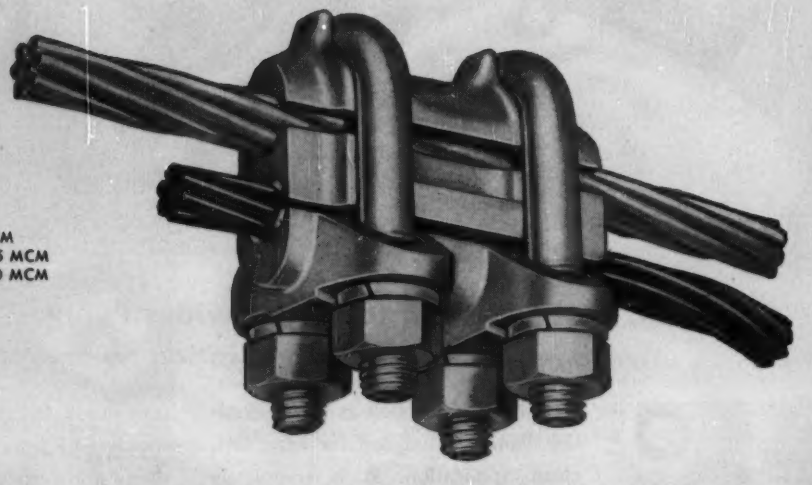
Name_____

Address_____

_____

CORROSIVE SOLDERING ELIMINATED!

in BLACKBURN'S Heavy Duty Bi-Metallic Connectors

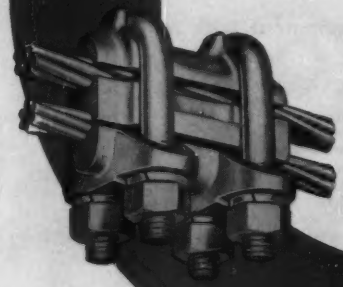


...4 MCM
...397.5 MCM
...—250 MCM

PRESSURE SEALED, SHRINK-FIT COPPER LINER SEALS OUT AIR AND MOISTURE—PERMANENTLY!

- Manufactured under controlled atmospheric conditions!
- Eliminating corrosive solders and fluxes between copper liner and aluminum casting insures permanent high conductivity.
- Factory applied protective coating prevents oxidation of contact spacer grooves during transit and storage.
- Castings are high-strength, heat-treated alloy with exceptionally heavy cross sections.
- Clamping forces are distributed over extra long surfaces—contour of grooves protects conductor.
- All Aluminum hardware is alumilited to prevent seizing—bolt features rolled threads of greater strength.

...MCM
...397.5 MCM



HEAVY DUTY ALL ALUMINUM CONNECTORS

Also available without copper liner for Aluminum to Aluminum. Coefficient of expansion same as conductor. Same high standard of material and construction as above connector.

BLACKBURN CONNECTORS

...JASPER BLACKBURN CORPORATION • 30 MADISON ST. • ST. LOUIS 4, MO. PHONE MAIN 1-3821

Thaw Profit Freeze-up at Drive-in

PAUL GIBSON, Industrial Power Sales Engineer, Baltimore Gas & Electric Co, Baltimore, Md.

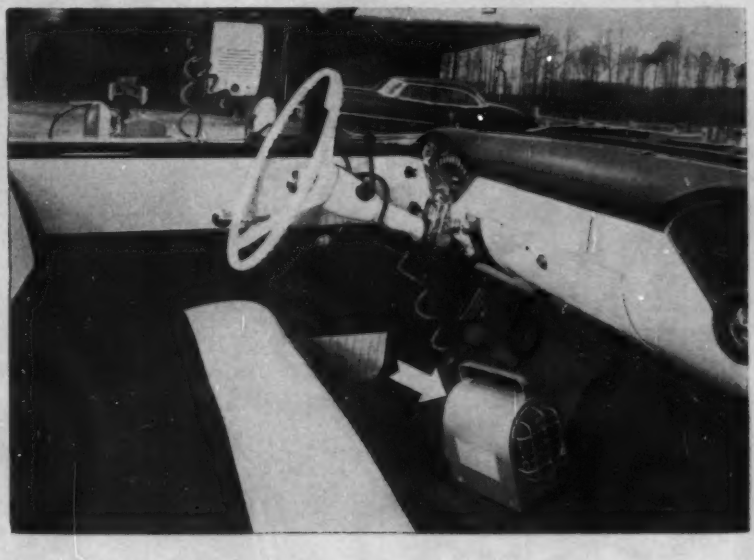
With 800 individual electric heaters which can be placed inside the patrons' cars, Timonium Drive-In Theatre, Timonium, Md., can now stay open throughout the winter weather, earn money all year round. Rated 500 w each, the little units are a real boon to business. Heaters can be regulated from a main switch which controls the entire load, from separate bank switches scattered throughout the parking area, or from the patrons' controls on the individual units. Total heater load is approximately 400 kw. The miniature heating plants work quietly and require no venting.

A discreet announcement that the heaters operate on 440 volts and will be left on till the last car leaves for the guests' convenience has prevented any pilferage. Under this system, no equipment has been lost. The Baltimore area has approximately 4203 annual degree-days. Before the heaters were put in, patronage dropped off as the weather cooled. The drive-in was forced to close in the winter, with a corresponding loss of revenue.

One of the largest drive-ins in the East, Timonium has a 50 by 100-ft screen, covers approximately 30 acres, and can accommodate 2,500 cars.

Individual 500-Watt Electric Heaters . . . .

Placed in Each Customers Car . . . .



Heat Exposed Dispatcher's Office

GEORGE C. WAGNER, Industrial Engineer, Union Electric Co, St. Louis, Mo.

Five electric heaters keep the dispatcher's room at the Pic Freight Co, St. Louis, Mo., warm and comfortable despite heavy traffic through two doors. The room is a small enclosure located on an open but roofed-over loading dock, about 150 feet from the main heating plant. The installation consists of five 2-kw heaters, flush-mounted at equal intervals along three of the rooms walls. Four inches of insulation hold heat losses to a minimum. The enclosure has an eight-foot ceiling and a total heated floor area of approximately 300 sq ft. The radiant component from the heaters assures comfortable working conditions even when the doors are being opened constantly. A separate temperature control allows the dispatcher to set the heat level to his own satisfaction.

Westinghouse
KILOWATT HOURS
TYPE DS
15 AMPS
Kh 36
SINGLE PHASE
Westinghouse
INTERVAL
RECORDER NUMBER

Helping the industry meet its growing loads

"Red tape" that saves you money

It is magnetic recording tape employed in a Westinghouse load survey recording meter.

The recorder is a development resulting from a need of Electric Utility management for a recording unit which is accurate, inexpensive and less demanding of man-hours.

The recorder utilizes both recording tracks of the standard tape at the same time. One side records time intervals, and the other records demand impulses—up to 240 per interval. The recorder may be used in conjunction with standard A-base or socket-type meters. Operation speed is such that the recorder will complete a full 32-day cycle on a single 600-foot reel of tape.

A translator has also been developed for "playback" of the recorded tape—through an IBM 526 Printing Summary Punch. A full reel may be translated—and the information put on permanent record IBM cards—in 35 minutes or less —without the requirement of engineer-interpreters, card-punch machine operators and the like.

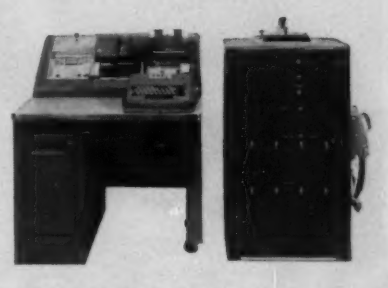
Information is so applied to the cards that practically any combination of load facts may be made quickly through application of an IBM card sorter.

In short, this is automation applied to your ever-present problem of determining load growth and load shift—and planning and adjusting your generation and distribution to match it efficiently and profitably. J-97209

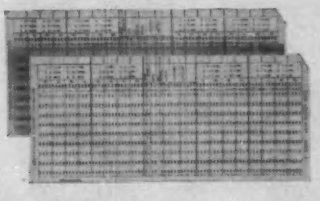
YOU CAN BE **SURE**...IF IT'S

Westinghouse

The Recording Mechanism. Accommodates standard 5" tape supply and rewind reels. Powered by 240-volt synchronous motor, operating at 2.35 inches per 15-minute interval. Recorder units interchangeable—simply "plug in" through bottom of meter-recorder case.



The Translator. Tapes are processed at 3¾" per second on 15-minute interval recordings, 7½ inches per second on 30-minute interval surveys. Processing of 600-foot tape on 15-minute interval requires 35 minutes—18 minutes for 30-minute interval recordings. Interconnects with IBM 526 Printing Summary Punch machine.

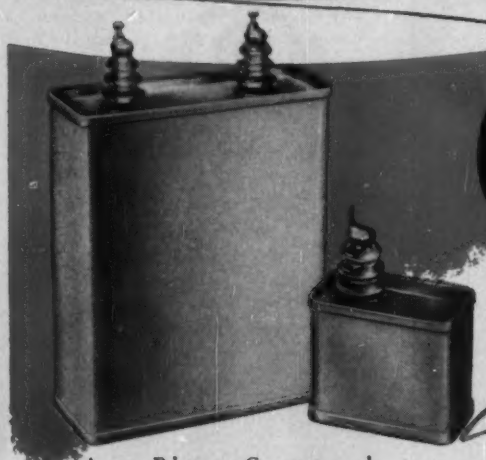


Permanent Record Delivered on IBM Cards. Cards provide for 80 columns of information and 12 positions in each column—plus customer and survey information, date and day of survey. On 15-minute interval surveys of 30-day duration, a total of 2880 demand readings are recorded, trans-speed of printing card punch. No interpreters required.

For *HIGH* Insulation Resistance and Low Power Factor

AEROVOX Polystyrene Capacitors are wound with

NATVAR Styroflex®



Aerovox Polystyrene Capacitors are designed for applications where stability and low dielectric absorption are essential—such as computing devices, tuned circuits demanding highest Q standards, capacitance bridges, and laboratory standards. They are available in many case styles and in capacities from 0.001 mfd to 25. mfd. and in voltage ratings from 100 VDC to 1600 VDC.

AEROVOX Corporation, with ten plants from coast to coast, have been manufacturing capacitors since 1922. As leaders in the field, they have been quick to take advantage of new and better materials, and to anticipate the demands of the fastest growing industry—electronics.

They use Natvar Styroflex because it has all of the outstanding properties of polystyrene, plus complete flexibility, toughness and uniformity.

Natvar Styroflex is available in standard thicknesses from .0004" to .006" in rolls from ½" to approximately 10" in width. Ask for data sheet St-1.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Isoglas® sheet, tape, tubing and sleeving
- Vinyl coated and varnished tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 23

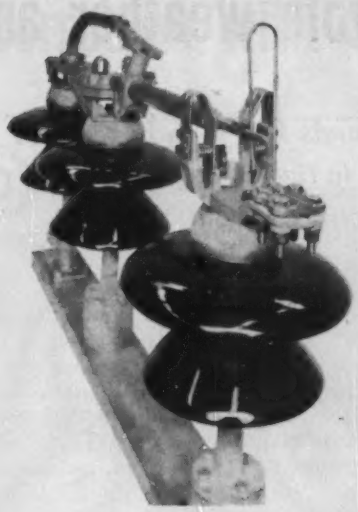
NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE FULTON 8-8800

CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY



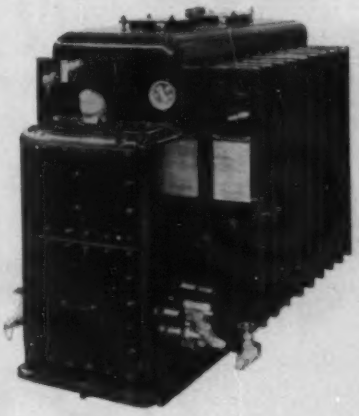
Disconnecting Switches

Outdoor disconnecting switches for sectionalizing and isolating circuits are offered for voltages from 7.2 kv to 345 kv. Known as the RF-2, the line has current ratings from 400 through 4,000 amp. Inverted "U"-shaped spring pressure contacts increase blade pressure during momentary flow. A rotating, vertical break blade is said to have high efficiency ice breaking.

Units may be mounted upright, vertical, or underhung, and can be adapted for group operation. Switch arm and rotating mechanism have anti-friction bearings throughout. Rotating insulator stops are located at the hinge to deliver maximum force to the blade. All contacts have heavy silver plating.

General Electric Co, Schenectady 5, N. Y.

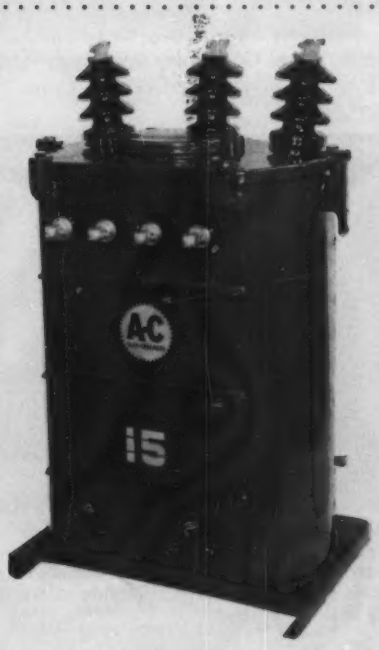
Network Transformers



Available in ratings to 750 kva, these Space-Miser network transformers are reportedly 20% smaller than earlier models, reducing the cost of vault construction and permitting substitution of larger ratings in existing locations. Flat, hollow, fin-type coolers, replacing the conventional tubes, are reported to reduce corrosion and simplify cleaning and painting.

Sealed, rolled flange low voltage terminals are bolted on for gasketed application, welded when no gasket is desired. Both styles eliminate clamping on porcelain shoulders and reportedly have high mechanical shock resistance. Terminal chamber is 4 in. wider, 2 in. deeper than previous models, provides more room for connecting high voltage cables.

Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.



Distribution Transformers

For service at 15 kv and below, these reduced size three-phase distribution transformers are available in ratings to 150 kva. Average reductions are said to be 13 in. in height, 22% in weight, compared to the former design.

Transformers have three-legged wound cores which are reported to have the economic advantages of preferred oriented steel. Other reported features are low losses and low exciting current. Lower size and weight are said to reduce pole height required.

The transformer is available either in conventional or in self-protecting designs.

Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.

(More New Equipment on page 90)

How Con Edison protects wiring from weather and

Sealtite in Con Edison's new Astoria, N. Y., plant withstands 150°F on boilers . . . takes up expansion on coal conveyor . . . speeds installation in tight quarters . . . protects wires from salt spray, steam, and dirt all around the plant.

1. Three- and four-inch Sealtite is used by Con Edison to take up expansion of conduits carrying heavy power cables on outdoor coal conveyor. At bottom of conveyor, not shown, is Con Edison's famous "floating dock." Here, Sealtite must absorb vibration when coal is being hauled up, resist weather, salt spray from river, coal dust and general grime from industrial area.

Sealtite* is the *original* flexible, liquid-tight conduit – made with tough, extruded polyvinyl jacket. Industry after industry is discovering how useful Sealtite can be. Con Edison has used it for years in its stations. No wonder their engineers put it to work in their newest, most modern plant. Here Sealtite is used: to protect wiring outdoors and in . . . in wet spots, dust spots, corrosive spots; where wiring must flex or be moved; to absorb vibration; to meet misaligned outlets; and to speed installation in cramped spaces.

TYPE U. A. is approved by Underwriters' Laboratories for service in wet spots. Copper conductor wound spirally inside conduit for positive ground.

TYPE E. F.† is extra flexible. Ideal for machine tool applications. Meets J.I.C. standards. Available in machine tool light gray at no extra cost from mill stocks.

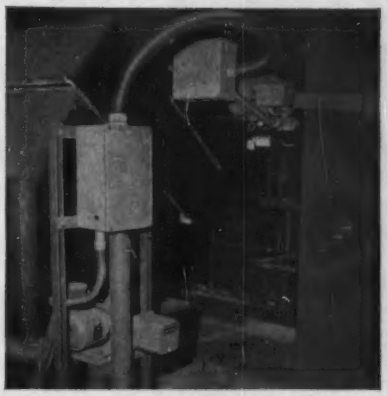
Electrical Wholesalers stock both types in easy-to-handle coils. Buy it in long lengths; cut it on the job without waste. They also stock special liquid-tight connectors manufactured by Appleton; Thomas & Betts; Gedney; and Pyle-National.

For more information, write The American Brass Company, American Metal Hose Division, Waterbury 20, Conn.

*Trade mark
†Pat. Applied for

2. Steam leakage forms white crud on ¾" Sealtite leading to aeriators on high pressure heaters. Despite high heat and corrosive conditions, Con Edison expects Sealtite to last the life of the equipment.

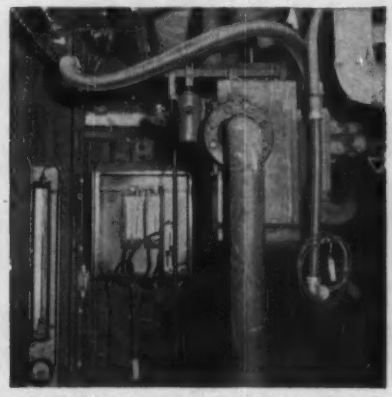
corrosion with Sealtite flexible, liquid-tight conduit



3. Movement—caused by rising and falling temperatures—is taken up by Sealtite leading from automatic combustion stokers to hot air dampers.

4. Too hot to handle! This is the top of one of the boilers at Con Edison's Astoria plant. A real hot spot—but Sealtite takes it day after day.

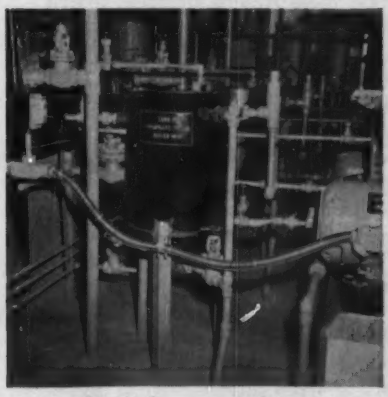
5. Sealtite speeded installation...saved time, trouble and money in tight quarters; e.g: Solenoid valves controlling water spray for ash in bottom of boilers.



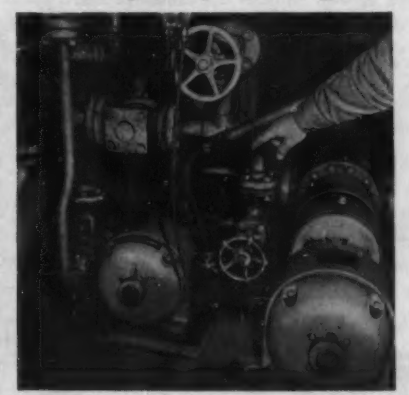
6. High pressure steam valves connected with Sealtite—where steam leakage and high heat are most severe. Sealtite resists moisture and grime throughout plant.

7. 120°F—and no shade. Sealtite is connected to high pressure heaters—where water is heated before return to boilers. Sealtite simplifies replacement of parts.

8. Six-inch rise and fall of boiler takes place as it heats and cools. 1½-inch and ¾-inch Sealtite takes up this movement, resists heat, moisture and dust. 67100



9. In chemical room, Sealtite connects phosphate pump. Here, phosphate and zeolite are mixed with water used in the steam generators. Tough vinyl jacket on Sealtite gives wires lasting protection.



10. Oily grit packs Sealtite on this motor connection. Still no trouble. This flexible, liquid-tight conduit takes up vibration, simplifies installation, protects wire and cable all around the plant.

Insist on the conduit marked

SEALTITE

an ANACONDA® product

ANCHOR

GENERAL PURPOSE SOCKETS

(LOW PRICED)

100 AMPERES
150 AMPERES

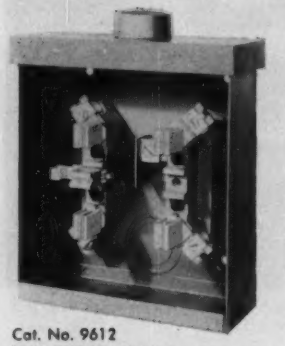
•

4, 5 or 6 TERMINALS
WITH OR WITHOUT
MANUAL BY-PASS

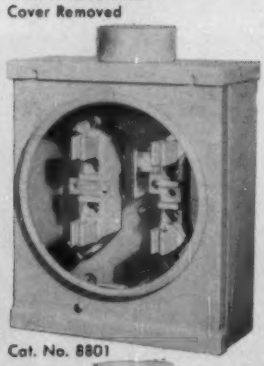
•

STEEL or ALUMINUM BOXES

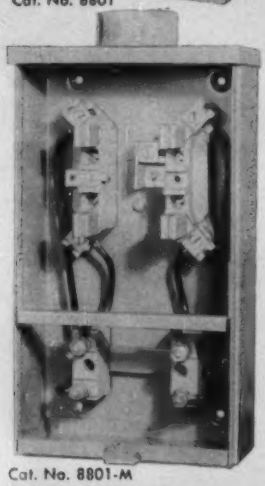
•



Cat. No. 9612
With Fifth Terminal
Cover Removed



Cat. No. 8801



Cat. No. 8801-M
Both Covers Removed

9600 series are rated 100 amperes and have 1/0 terminals.

8800 series are rated 150 amperes and have 4/0 terminals.

These single position sockets have "J" shaped open top terminals equipped with maximum diameter screws having specially cupped ends which grip aluminum or copper conductors without injury to the strands.

Can also be furnished with similar screws equipped with pressure plates.

Porcelains have projections under the terminals which permit the use of heavy pressure to tighten the screws without distortion of the terminals.

Covers are without crossbars in meter opening but with internal lock.

Single or double neutrals can be supplied.

Hub sizes through 2½". Ample knockouts for 1", 1¼", 1½" conduits, in 9600 series and 2" maximum in 8800 series.

We will make special modifications including increase in box height on quantity orders.

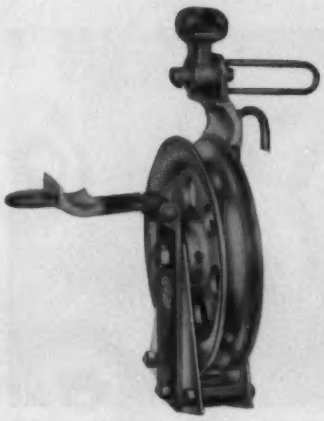
ANCHOR MANUFACTURING CO.
MANCHESTER, NEW HAMPSHIRE

Switchgear

Low voltage drawout switchgear which allows disconnection of primary breaker contacts with cell door closed is offered in ratings from 15,000 to 75,000 amp interrupting capacity. With the circuit breaker in test position, cell door may be closed by depressing a spring-loaded escutcheon plate less than two inches.

Manufacturer claims dust problems are eliminated and that installation and repair of feeder circuits can be done in complete safety. Other reported features are improved bus bracing, cell mounted interlocks, and an auxiliary safety trip bar to prevent accidental breaker withdrawal.

Federal Pacific Electric Co, Eastern Switchgear Div, 888 N. Keyser Ave, Scranton, Pa.

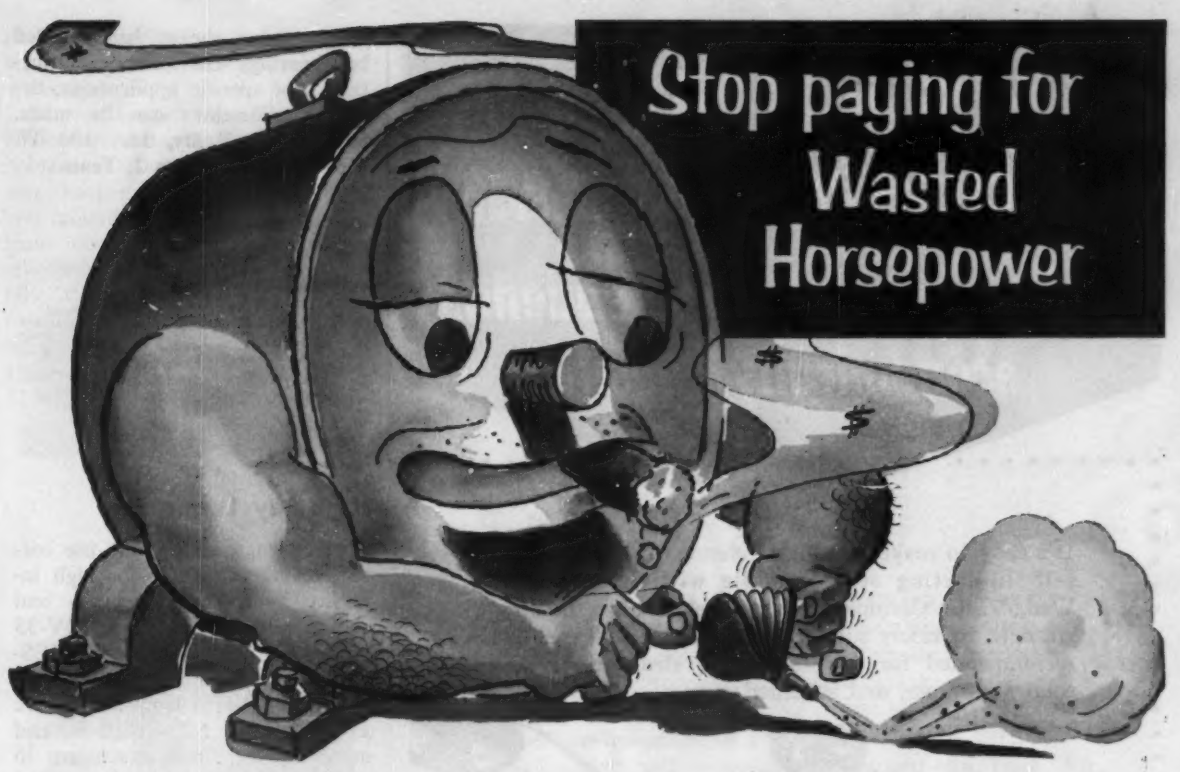


Snatch Block

On these No. 74 stringing snatch blocks, a light weight aluminum conductor guard which follows the sheave contour reportedly reduces the possibility of conductor damage and keeps it from working between sheave and side plate. The block incorporates a safety-locking feature to prevent accidental opening but is claimed to open easily when pin is rotated 90 degrees.

Available in 5 standard sizes from 7 x 1.375 in. to 16 x 2.125 in., it can be obtained with any of the following strong, light weight forged steel fittings: swivel hook, socket connector, swivel eye, upset swivel shackle. The aluminum

(*Continued on page* 92)



Stop paying for Wasted Horsepower

Just match your average load . . . let silicones carry the overloads

If you specify horsepower to equal "peak overloads," your motors work at full rated capacity only part of the time — you're paying for unused horsepower. Today, silicone insulation has outmoded this kind of wasteful over-motoring. Motors insulated with Dow Corning Silicones have a service factor of 25 to 50% . . . so now you can merely match your average load, and let this *built-in* service factor handle intermittent overloads.

Lower your motor costs! For every dollar wasted on unused motor capacity, you spend an additional $3 for starters, cable, transformer capacity and installation. Silicone insulated motors *save* you real money!

Boost your production! Motors insulated with Dow Corning Silicones have much greater resistance to heat, moisture, and corrosive atmospheres . . . assure *more continuous production.*

Remember, over-motoring is outmoded

Get sources for silicone insulated equipment—mail coupon today

Here's more proof for you...

The Philip Sporn plant on the American Gas and Electric System installed its first silicone insulated motor over 6 years ago . . . a 1000 hp, 1190 rpm forced draft fan motor built by the Elliott Co. Smaller and less costly to install than an equivalent 1500 hp conventional motor, this unit has been operating in ambient temperatures up to 120 F without a sign of failure to date. Starting against cold air 4 times a day, it is overloaded by 30% bringing its total rise to 250 F with an output of 1300 hp. This kind of dependable performance has led American Gas and many other leading utilities to standardize on silicone insulated auxiliary motors.

Dow Corning Corporation, Dept. 4417, Midland, Mich.

Please send me sources for Silicone insulated
☐ Motor ☐ Transformers ☐ and Reprint
"New Developments in Silicone Insulation."

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

DOW CORNING SILICONES

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT
LOS ANGELES • NEW YORK • WASHINGTON, D.C. (Silver Spring, Md.)

CANADA: Dow Corning Silicones Ltd., Toronto
GREAT BRITAIN: Midland Silicones Ltd., London
FRANCE: St. Gobain, Paris

KEARNEY WEDGE-TITE CLAMP

makes dependable deadends economically, easily

It's easy to make reliable deadends on bare neutral self-supporting service cable with KEARNEY Wedge-Tite Clamps. They develop high holding strength to safely support the span . . . and are recommended for use on ACSR, stranded or solid aluminum, and stranded copper.

Two-piece clamps are available with solid or flexible stainless steel bail. Either type is simple to install in that neutral does not have to be threaded through clamp. One-piece clamps are made so parts can't become separated. To install, neutral is threaded through clamp, and wedge moved into place after sagging the cable.

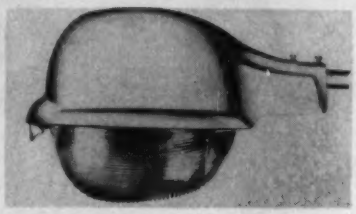
-359

JAMES R. KEARNEY CORPORATION, *General Offices:* **4224-42 Clayton Ave., St. Louis 10, Mo.**

for BETTER CONSTRUCTION SAFER MAINTENANCE *Specify* **KEARNEY PRODUCTS**

Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA. — GUELPH, ONT., CAN.

alloy groove sheave has shielded ball bearings with Alemite lubrication. For specific applications, design modifications can be made. **Sherman & Reilly, Inc, 100 W. First St, Chattanooga 2, Tenn.**



Highway Luminaire

Designed specifically to use corrected mercury lights for high intensity lighting of roadways and similar areas, these type OV-35 luminaires produce Type III IES-ASA distribution with Type J-H1, B-H17, or B-H18 lamps. They are available with 1.25- or 2-in. end mounting for direct attachment to standard poles and brackets. The bracket clamp is easily accessible but enclosed for weather protection and neatness. The refractor and ring assembly can be opened and closed with one hand.

Refractor is heavy, pressed, high transmission glass, with a one-piece, drawn-aluminum specular reflector. Reflectors for 400 and 700-w lamps are easily interchanged. Socket positions for the two lamp sizes are obtained by reversing the L-shaped mounting bracket. Completely gasketed to form a sealed optical system, the luminaires weigh 31 lb, measure 16.5 in. wide by 17.625 in. deep by 20.625 in. long. Outer housing is one-piece aluminum alloy casting.

Westinghouse Lighting Div, Edgewater Park, Cleveland, Ohio.

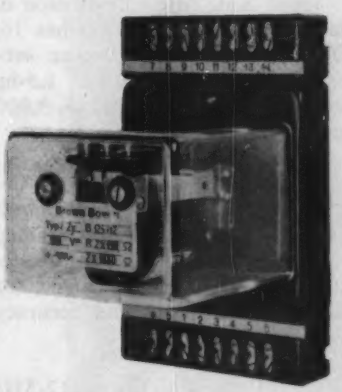
Fuses

These one-time, low-voltage, cartridge type fuses, designated type CLF, are offered with ratings of six to 4,000 amp and an interrupting capacity of 200,000 amp symmetrical. Designed to interrupt short-circuit currents in less than a quarter of a cycle, they are intended for protection of branch feeders, motor

starters, control power circuits, lighting circuits, and other high capacity applications.

Silvered copper ferrules or knife blades on ends fit standard fuse holders in sizes up through 600 amp. Larger models have tangs for bolt mounting. A fusible silver element, connecting the two ferrules, is imbedded in inert granular quartz filler which cools the arc without expelling gases or material from the tube.

General Electric Co, Schenectady 5, N. Y.



D-c Contactor

This high-speed d-c contactor, designated type F, has a reported pickup time of 1.8 milliseconds. It is said to be useful for breaker control circuitry and other applications requiring extremely fast operation. Available with 4 NO, 4 NC, or 2 NO and 2 NC contacts, the unit is claimed to have a sustained current rating of 5 amp and a making current of 20 amp. Continuous power consumption is 4 w; inrush power, 10 w.

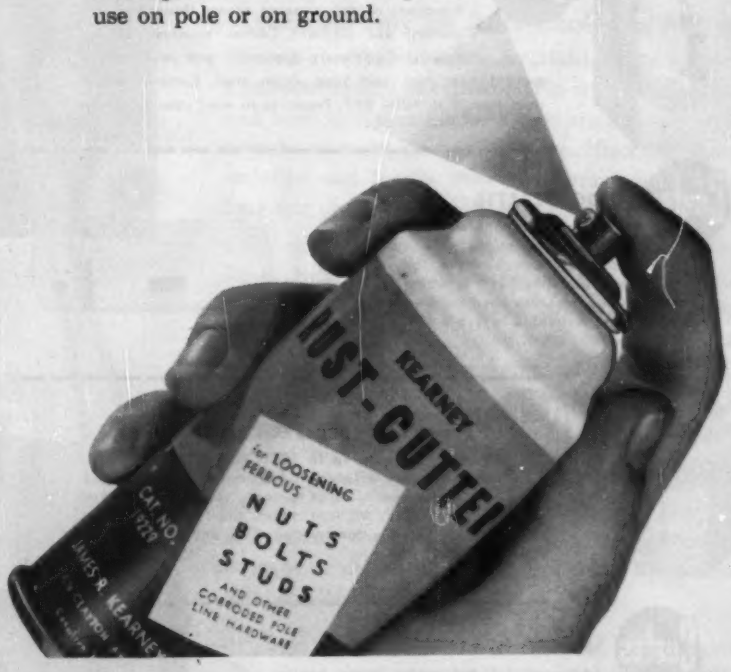
Breaking current is rated as 0.45 amp resistive or 0.35 amp inductive at 125 v dc; 0.35 amp resistive or 0.20 amp inductive at 250 v dc. Manufacturer states that two million close-open operations produce no noticeable wear. Unit shown measures 5.25 x 3.5 x 2.25 in.; contactor proper, 3 x 2.25 x 3.25 in.

Brown Boveri Corp, 19 Reactor St, New York 6, N. Y.

(*More New Products on page* 94)

KEARNEY
RUST-CUTTER
loosens "frozen" nuts and bolts . . . in seconds

New *Rust-Cutter* chemical discovery—specially compounded by KEARNEY—*acts in seconds* to loosen ferrous nuts, bolts, other corroded hardware. Far superior to ordinary penetrating oils, Rust-Cutter's atomized mist (harmless to skin) reaches otherwise inaccessible rust and corrosion particles. Packaged in self-contained pressurized can, easy to use on pole or on ground.



-382

JAMES R. KEARNEY CORPORATION, *General Offices:* **4224-42 Clayton Ave., St. Louis 10, Mo.**

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SAFER MAINTENANCE
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Plants at: ST. LOUIS • FAYETTEVILLE, ARK. • SHENANDOAH & CLARINDA, IA.—GUELPH, ONT., CAN.

For TOPS in Hot Water WITH ELECTRICITY

THE SPOTLIGHT IS ON...

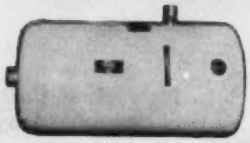
Coates Electric MFG. CO.

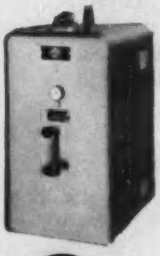
Electric Power heats water more efficiently. Cleaner, safer and less costly. Coates Electric Manufacturing Company for the past 25 years has produced top quality Boilers, Boosters and Storage Tanks.

Coates

HOT WATER BOOSTER

Adds 40 degrees F. to "standard" hot water of 140 degrees F. Provides hot water needed for dishwashing rinse. Kills all bacteria. Completely automatic . . . meets all sanitation requirements. Built to conform to A.S.M.E. Code. UL and CSA approved. Sizes from 3KW to 45KW.





Coates

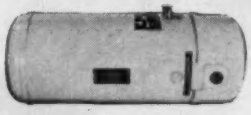
ECONOMY ELECTRIC BOILER

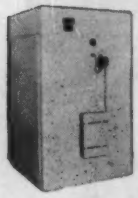
Hundreds of dry cleaning plants throughout the country use efficient Coates Economy Electric Boilers. Completely automatic and insulated to prevent heat loss and keep shops cool. Compact boiler sizes from 1 to 1000 BHP. Pressures to meet your demands.

Coates

BOOSTERETTE

Compact and lightweight. Does same job as Booster, only for smaller capacities. Can be used for sink rinse compartment. Supplies 180° F. water for rinsing dishes bacteria-free. No need for toweling dishes or silverware. Available in 3-6-9 KW.





Coates

Lge. Capacity STORAGE TANKS

Any capacity up to 2000 gallons. Insulated for maximum efficiency and minimum heat loss. Finest quality large quantity tanks for industrial and commercial use. All tank seams arc fusion-welded to ensure safest possible construction. CSA and UL approved. Meets A.S.M.E. Code.

Coates

HOME HEATING UNIT

Adapted for hot water home heating. Amazingly compact, takes only a space of 12"x12"x24". Provides automatic, uniform heat. Electric heat is clean, no dirt, no hot or cold spots. Completely eliminates chimney.

Coates Electric MFG. CO.

COATES ELECTRIC MFG. CO.

Dept. EW-5, 3419 11th Avenue S.W., Seattle 4, Washington

"If it's done electrically it's right"

More New Products

Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio, offers Reeves Vari-speed Motodrive **variable speed motors** in sizes to 5 hp for use with manual or automatic controls in industrial applications.

General Electric Co, Schenectady 5, N. Y., has available a Form 106U 6-ft, single lamp fluorescent **luminaire** for tunnel and underpass lighting. Rapid Start F7T12/CW/RS, Slimline 72T8 (300ma), and Slimline 72T12 (600 ma) lamps are available.

Speed King Mfg Co, division of Jaeger Machine Co, Columbus 16, Ohio, offers a multi-purpose submersible **pump,** with a 1.5-hp motor which is said to handle 3,300 gph at a 5-ft head.

Performance Measurements Co, 15301 W. McNichols Rd, Detroit 35, Mich., has a digital reading vacuum tube **voltmeter,** with ranges of zero to 1,000 v, ac and dc, for testing where speed and accuracy are important.

Ebert Electronics Corp, 212-31G Jamaica Ave, Queens Village 28, N. Y., has an MR-14 MiniRelay dpst **relay.** It is rated 1.5 hp or 20 amp at 115 v ac, 10 amp at 230 v ac, and 5.2 amp at 440 v ac; 6.5 amp at 120 v dc, or 3.5 amp at 230 v dc.

Electro Products Laboratories, Inc. 4500 N. Ravenswood Ave, Chicago 40, Ill., has a Model 4951-RAC **proximity pickup** control for electrical machinery, electromechanical counters, and control circuits.

Atkomatic Valve Co, Inc, 545 W. Abbott St, Indianapolis 25, Ind., markets a stainless steel solenoid **valve,** Type SBTDW, which is said to be absolutely bubble tight at pressures to 5,000 psi for 0.125 and 0.25-in. pipes.

Bishop Mfg Co, Cedar Grove, N. J., is marketing Type 2A Bi-seal electrical **tape** for temperature ranges from —55C to +85C. It is said to have improved weathering.

ONE-TON TEST

proves physical strength of "Integrated" field coils in ALLIS-CHALMERS MOTORS

It's not likely a field coil of a motor would ever be punished this way. But tests like this illustrate the inherent ability of Allis-Chalmers "INTEGRATED" FIELD COILS to withstand the stresses created by the most severe loading conditions of a motor.

Available only on Allis-Chalmers Motors

"Integrated" field coils, available only on Allis-Chalmers motors, are enveloped in oriented glass fibers and heat-stabilized resins. These are securely locked to poles to resist mechanical force. High dimensional stability and tensile strength characteristics assure long life under the toughest of operating conditions.

Coils are surface sealed against atmospheric contaminants. In addition, the coefficient of expansion of insulation is similar to that of copper. Heat transfer qualities are excellent. "Integrated" coil structures can withstand the most severe thermal cycling found in normal operation.

Exclusive Allis-Chalmers

"Double-protection," combining new "Integrated" field coils with *Silco-Flex* all-silicone stator coil insulation, is available for rotating and stationary elements of large ac or dc machines with operating temperatures through Class B range.

For the whole story of Allis-Chalmers motors, contact your local A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Silco-Flex is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5276

Nelson
MOTOR CONTROL CENTERS
make it talk louder!

When all the costs are totaled up at the end of the job Nelson's ease of installation and compact design will let you beat the estimate.

And even that is not the whole story. Nelson's coordinated design, using components specially selected for long trouble-free service, means less maintenance cost down through the years. If saving money is important you will specify and buy Nelson motor control centers.

. . . . MONEY ISN'T EVERYTHING

Other things are also important. The people at Nelson are interested in seeing that you have the very best workmanship. Nelson engineers with their long experience in motor control will see that your job is built to do exactly what you want it to do. Cooperative team work is more than a phrase at Nelson.

. . . GET THE FULL STORY

Write for the descriptive brochure that gives you full details on Nelson motor control centers. Sizes, types, components, design features and sample specifications are all included.

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P. O. Box 5385 — Tulsa, Okla.
Please send me a free copy of your new Nelson Motor Control Center bulletin.

NAME_____

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ADDRESS_____

CITY_____

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

CATALOGS—BULLETINS

• STEEL PIPING: A data folder on seamless and welded steel pipe for 16 sizes of pipe from ⅛" to 8" nominal sizes has been published by B&W. Folder gives OD, ID, wall thicknesses, and weights per ft. ASTM and ASME specifications are also included. Ask for TDC-138 from General Sales Offices of the Tubular Products Division, Babcox & Wilcox Co, Beaver Falls, Pa.

• POWER RECTIFIERS: Two bulletins, No. AC-57-A and AC-57-R, on power rectifiers for uses requiring closely regulated dc voltages have been issued by Christie Electric Corp, 3410 W. 67th Street, Los Angeles 43, Calif.

• PANEL METER: A data sheet on the 1½" Flush Mounting Panel Meter, Model 155, has been published by the manufacturer, International Instruments, Inc. P.O. Box 2954, New Haven 15, Conn.

• BALL & ROLLER BEARING CHART: Norma-Hoffman Bearings Corp has made available two wall charts of compiled series listings of ball and roller bearings offered by various manufacturers. Write the company at Stamford, Conn.

• REMOTE STRIP CHART RECORDERS: A 4-page folder describing and illustrating ROYSON INDENTICHARTS that record on strip charts from a remote point time and sequence conditions during process control operations has been issued by Royson Engineering, Hatboro, Pa.

• CENTRIFUGE: A bulletin describing the De Laval Model AC-VO Nozzle-Matic Centrifuge has been published by De Laval Separator Co, Poughkeepsie, N. Y.

• OPTICAL TOOLING EQUIPMENT: An illustrated catalog of its complete line of optical tooling equipment has been published recently by Keuffel & Esser Co, Hoboken, N. J.

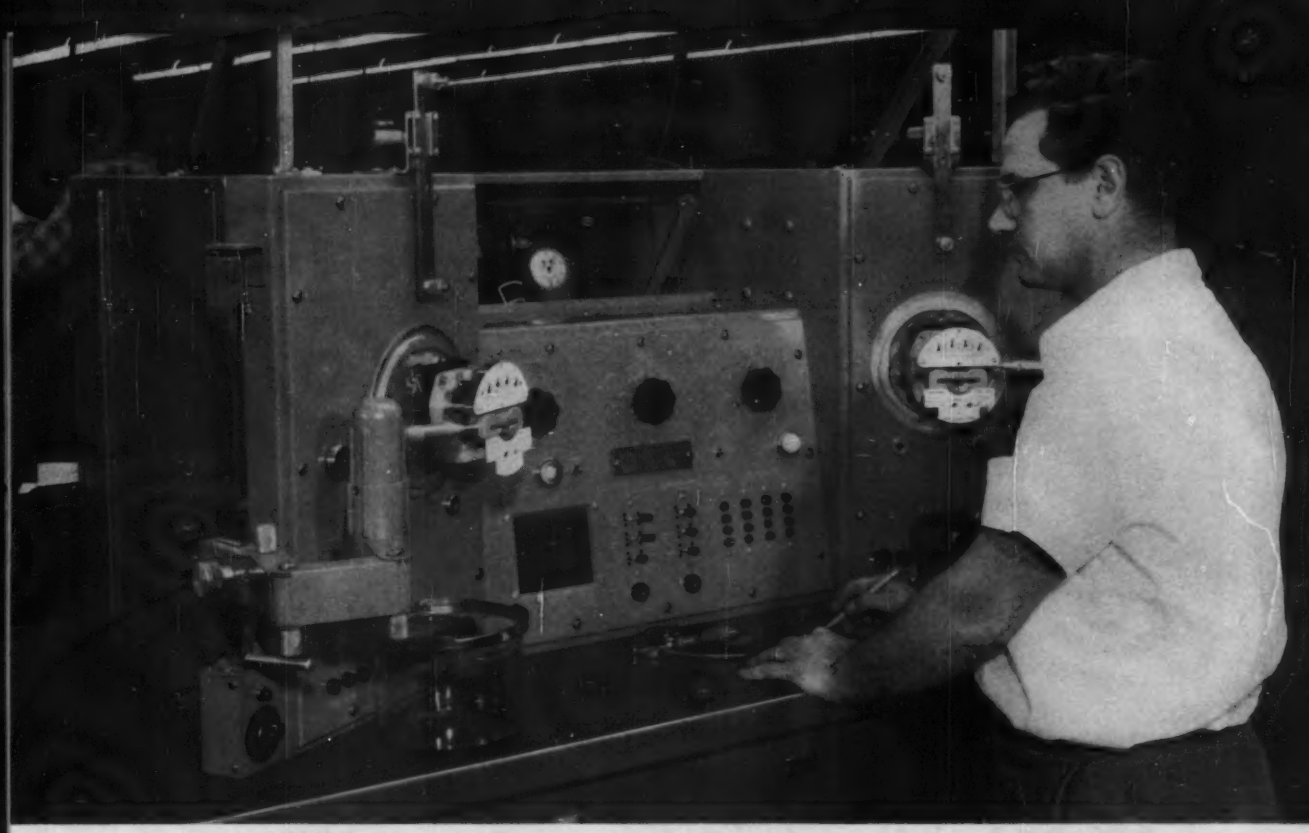
• CONTROL TRANSFORMERS: Catalog 956 describes the line of normal reactance type control transformers manufactured by Hindle Transformer Co, Inc, Woods Church Road, Flemington, N. J.

• SILICON CARBIDE HEATING ELEMENTS: Globar Division of Carborundum Co has announced a 12-page booklet covering its line of silicon carbide heating elements. Known as the "Hot Tips" booklet, Form A-1472, it is available from the company at its Hyde Park Blvd, Niagara Falls, N. Y. office.

• TITANIUM METAL PIPE: A folder describing the uses and behavior of seamless titanium metal pipe in severe corrosive enviroments has been published by B&W. Copies of TDC-185 are available from General Sales Offices, Tubular Products Division, Babcox & Wilcox Co, Beaver Falls, Pa.

• VARIABLE SPEED DRIVES: A 4-page flyer covers the Magne-Speed "Junior" variable speed drives made by Magnetic Amplifiers, Inc, 632 Tinton Avenue, New York 55, N. Y.

• WIRE: Two flyers describe wire made by Philadelphia Insulated Wire Co. One covers the Series "120" lead wire, the other Series "200" hook-up wire. Write the company at 200 N. Third Street, Philadelphia 6, Pa.



LOOK TO YOUR OWN RECORDS

for unbiased proof of watthour meter performance

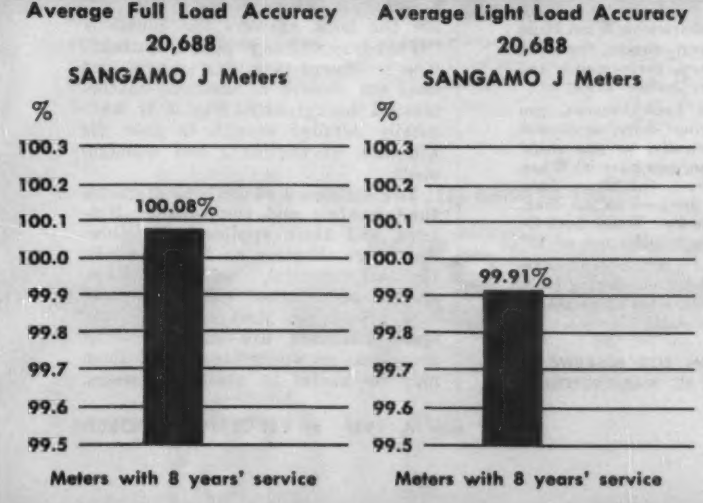
Want to know the facts about the watthour meters on your company's lines? How they stand up in service? How accurately they retain their calibration—what it costs to keep your meters on the line? Then, look to the test records and accuracy reports of your own Meter Department—kept for your information as a company executive.

We think that you will be surprised—and pleased with the performance of the Sangamo Meters on your lines.

Shown below are meter accuracy records from one large operating utility that show the average full load accuracy and the average light load accuracy of more than 20,000 Sangamo J Meters after 8 years of service.

Such sustained accuracy is characteristic of Sangamo Watthour Meters. And such sustained accuracy is the reason why the J2 is your best investment in a watthour meter.

Actual performance records of 20,688 J Meters after 8 years service

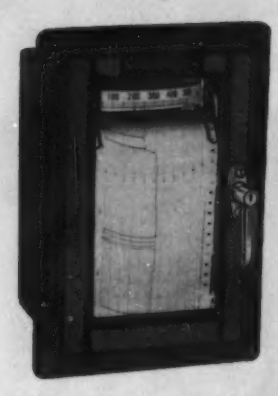


SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM57-3

QUALITY is not an accident



Product Representatives in Most Principal Cities

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It is not attained over night.

Quality is built into E-A Recorders by specialists—workmen whose livelihood depends upon quality and who have spent their lives making just this one product.

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Stop Drag
Reduce Wear

OVER 100,000 WARN HUBS NOW IN USE ON 4-WHEEL DRIVES

Free-wheeling 2-wheel drive with Warn Hubs means big savings in gear, engine, tire wear, gas, *plus* the pep, speed, performance and high gear power of *any* 2-wheel drive.

And now, with Warn Lock-O-matics, you have free-wheeling 2-wheel drive, or normal 4-wheel drive automatically, *as you shift!* When you need traction, you have it! When you shift to 2-wheel drive, you *always* have *free-wheeling* 2-wheel drive—with no drag, front gear whine, shimmy. Warn Lock-O-matics truly make "two vehicles out of 1!"

Ask *your* truck dealer for a free demonstration of Warn Lock-O-matic or Locking Hubs (manual control), or write for literature today! Models for all 4 w.ds. to 1½ tons.

WARN MFG. CO. RIVERTON BOX 6064-EW5, SEATTLE 88, WASHINGTON

BOOKS

Books Received Since February 14

Elektrische and Magnetische Potentialfelder. By H. Buchholz. Published by Springer-Verlag, Reichpietschufer 20, West Berlin 35, Germany. 552 pages, illustrated. Price DM 72.

Practical Electrical Wiring. By H. P. Richter. Published by McGraw-Hill Book Co Inc. 330 W. 42nd St, New York 36, N. Y. 602 pages, illustrated. Price $6.75.

British Plastic Year Book. Published by Liffe and Sons Ltd, Dorset House, Stamford Street, London S.E. 1, England, 716 pages, illustrated. Price 42 shillings.

Inventors and Inventions. By C. D. Tuska. Published by McGraw-Hill Book Company, 330 West 42nd Street, New York 36, N. Y. 135 pages, illustrated. Price $3.75.

Electrical Engineering Circuits. By Hugh Hildreth Skilling. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, New York. 724 pages. Price $8.75.

Engineering Thermodynamics. By C. Osborn Mackey, William N. Barnard, Frank O. Ellenwood. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 419 pages. Price $7.95. Illustrated.

An Introduction To Semiconductors. By W. Crawford Dunlap, Jr. Published by John Wiley & Sons, Inc. 440 Fourth Avenue, New York 16, N. Y. 407 pages, illustrated. Price $11.75.

Electricity and Magnetism. By J. Newton. Published by Philosophical Library, 15 East 40th St., New York 16, N. Y. 597 pages. Price $10.00 illustrated.

Automation, Present and Future

Automation in Business and Industry. Edited by E. M. Grabbe. Published by John Wiley & Sons, Inc. 440 Fourth Avenue, New York 16, N. Y. 611 pages, illustrated. Price $10.00.

This book provides a useful survey of the automation field. Material in the book is authored by 21 experts, each a specialist in some phase of automation. As suggested in the preface the book answers the questions "What is new?" and "How is it used?" The treatment is rather general and does not require an exacting mathematical background. But it is technically detailed enough to gain the attention of engineers and management.

The early part of the book discusses fundamentals and components. Systems and their applications follow. There are chapters on fundamentals, feedback control, instrumentation, analog and digital computers, and data processing. And while the systems discussed are manufacturing processes, an understanding of them may be useful to utility engineers.

New Forward Control Design provides more space because the engine is behind you. It puts a 74" pickup box on 81" wheelbase—record-breaking cargo space per inch of wheelbase. This efficient design makes maneuvering through rough terrain faster and safer.

How the New Forward Control 'Jeep' FC-150 saves time and money on service jobs!

All-Wheel Traction. With the extra traction of its 4-wheel drive, the FC-150 travels through mud, and climbs hills as steep as 65% . . . in good weather or bad. Yet, it shifts easily into 2-wheel drive for highway travel at top legal speeds.

On job after job, 24 hours a day, the all-new Forward Control 'Jeep' FC-150 helps assure uninterrupted electrical service, with savings of time and manpower. That's because it's made to order for electrical industry service jobs.

Here's a 4-wheel drive truck that gives you maximum cargo space on minimum wheelbase. It maneuvers through heavy brush, mud or snow, with crew and equipment, where ordinary trucks call it quits. Riding comfort!—you have to test drive it to believe it! There's plenty of head, leg, and shoulder room! The all-new Safety-View cab lets you see terrain as close as 6 feet from the front bumper. It combines with the new wrap-around windshield—largest in the FC-150 weight class—for up to 200% greater forward visibility. And with power take-off, the FC-150 operates a wide variety of special equipment from winches to trenchers.

The new 'Jeep' FC-150, G.V.W. 5,000 lbs., is powered by the economical engine that made 'Jeep' vehicles famous. It combines with a new 16-gallon gas tank to let you cruise up to 300 miles on *one* filling. See your 'Jeep' dealer for a demonstration today!

There's a 4-Wheel-Drive 'Jeep' vehicle for your job!

Universal 'Jeep'

'Jeep' Truck

'Jeep' Utility Wagon

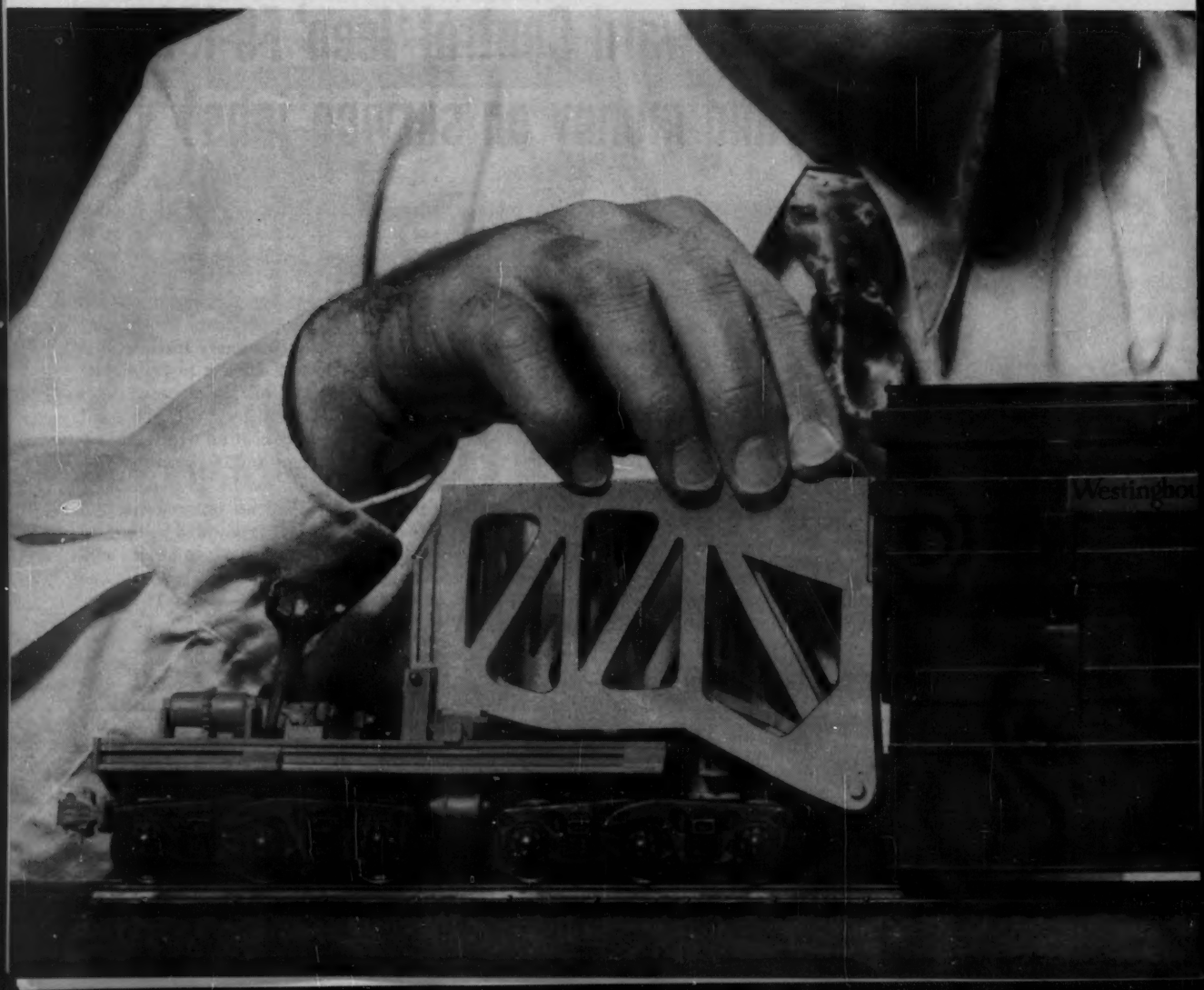
'Jeep' Forward Control 4-Wheel-Drive FC-150

WILLYS . . . world's largest makers of 4-Wheel-Drive vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

REVOLUTIONARY WESTINGHOUSE TRANSFORMER RAILROAD CAR SPEEDS DELIVERY, SLASHES INSTALLATION COST

Truss-supported transformer travels only six inches above rails—compared with forty-eight inches when loaded on depressed-center car. Lower center of gravity allows faster rail movement; transformers need not be sectionalized . . . saves you installation time and cost.



Westinghouse Form-Fit® power transformers —which for 15 years have led the industry with record-breaking capacities now have even more "room to grow". A revolutionary new railroad car, designed by Westinghouse and built by the Greenville Steel Car Company will make it possible to ship even greater capacities upright without sectionalizing.

The new car has a load capacity of 250 tons, and will carry a transformer 28 feet long. The car is comprised of two identical end sections, the transformer itself being the center section. Steel trusses mounted on the end sections support the transformer. Although the car has a total length of almost 90 feet when carrying the maximum size transformer, it will negotiate the same curves as a standard boxcar. This allows more direct routing . . . time saved helps speed your construction schedules.

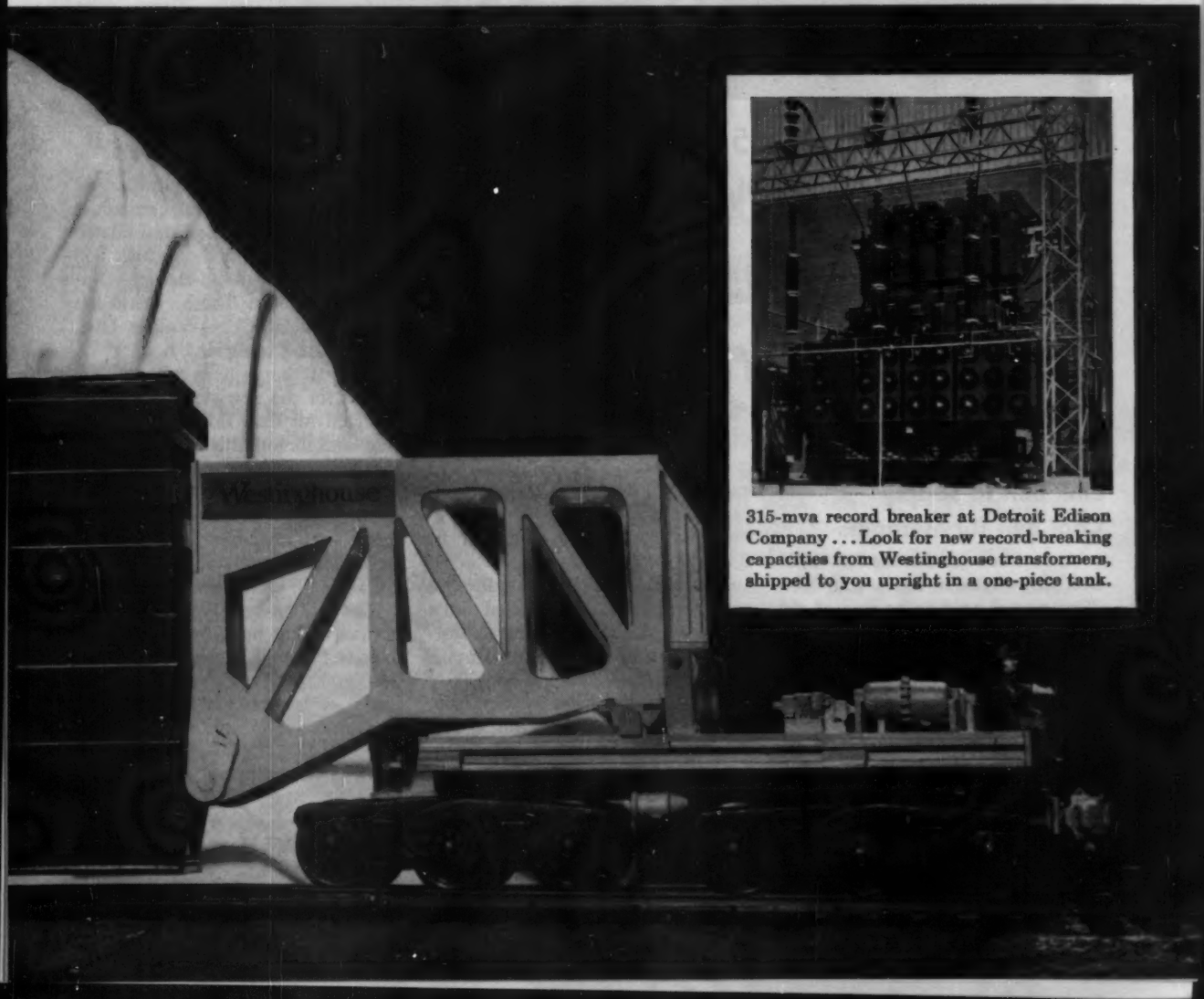
Westinghouse Form-Fit power transformers utilize the basic shell-form transformer design with the coils inside the core. This provides more compact design—the highest rating-per-pound available—plus superior mechanical and dielectric strength and thermal capacity . . . increasingly important factors as transformer ratings and physical size both grow.

The new railroad car for transporting Form-Fit transformers adds new possibilites to this room-to-grow design, provides the means for shipping still larger transformers . . . at the same time cuts your delivery time, installation time and cost.

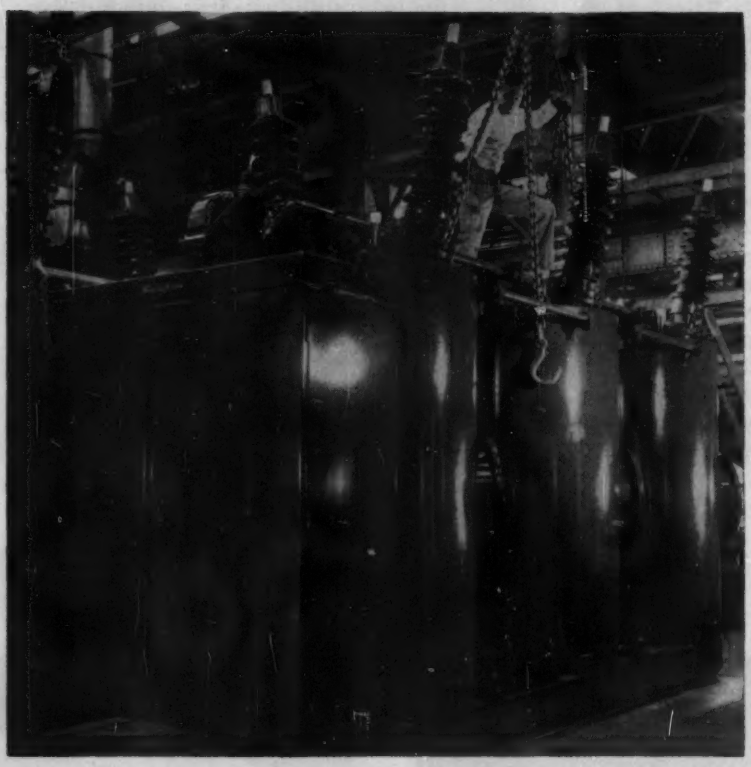
J-70805

YOU CAN BE SURE...IF IT'S

Westinghouse



315-mva record breaker at Detroit Edison Company . . . Look for new record-breaking capacities from Westinghouse transformers, shipped to you upright in a one-piece tank.



Westinghouse Ships 5,000 Mva Breaker

This 3-pole, 5,000-kva, 69-kv, tubular-grid, oil circuit breaker was shipped recently by Westinghouse Electric Corp for installation on the Florida Power & Light Co system.

First of its rating built, according to a company spokesman, the three-pole unit was shipped completely assembled on a unit base mounting ready for installation.

A total of 26 of the tubular-grid oil circuit breakers are to be delivered to the southern utility during 1957 and 1958.

L-M Substation Model Shows Flexibility Design

Field engineers of Line Material Industries, Milwaukee, Wis., are using a substation model to demonstrate to utilities the design features and structural standardization of L-M substations. Readily illustrated are such features as ease of future addition of new substation bays and simplicity of circuit changes or mounting of new equipment.

Each substation model contains examples of box trusses and triangular trusses used both as horizontal structural members and vertical columns. Methods of joining the different types of trusses are shown. The practice of prepunching chord members is illustrated. Prepunching and easily read identification codes on each structure component make possible rapid field erection of L-M substations.

Link Belt to Supply Coal Belt for Memphis

A contract was awarded to Link-Belt Co, Chicago, for a coal handling system said to be one of the largest to be installed as initial equipment. This system is for the new Thomas H. Allen electric generating station of the Memphis Light, Gas & Water Division, City of Memphis, Tenn.

The new Memphis station, which will have an initial nominal rating of 750,000 kw with an expected gross capability of 862,500 kw, is expected to double in the next 10-year period. The initial capacity of the coal handling system will be 2,200 tons per hr.

The coal handling belt conveyor equipment will convey coal from barges to coal crushers and to storage and from crushers or storage to coal bunkers. It will consist of a dual-belt conveyor system from the coal barge receiving bin to coal bunkers, with each conveyor handling 1,100 tons per hr; a single belt system to storage, handling 2,200 tons per hr, and two belt systems, each handling 1,100 tons per hr.

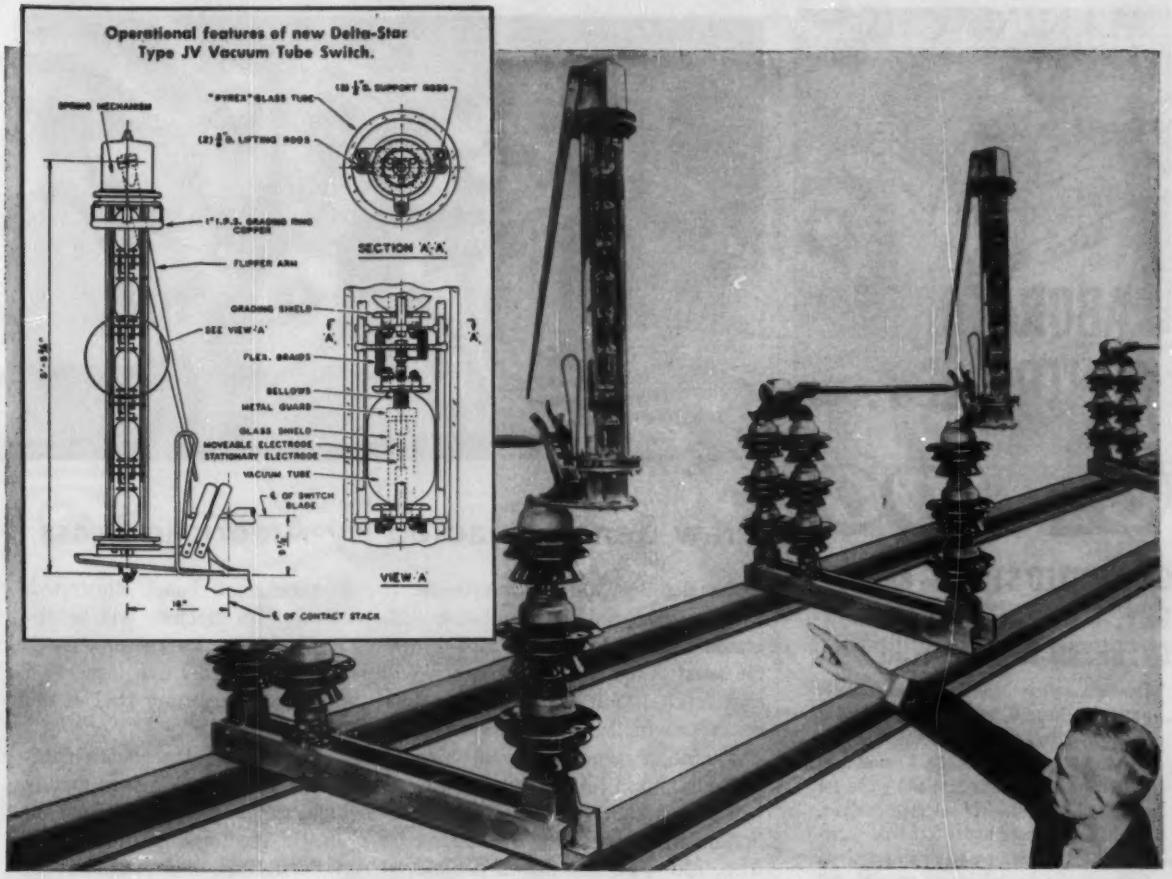
Blaw-Knox Furnishing Soot Blowers for Con Ed

Two of the reportedly largest steam generators being manufactured, on order by the Consolidated Edison Co of New York, Inc, will be equipped with all-electric soot-blowing systems. These systems are being built by Copes-Vulcan Div., Blaw-Knox Co, Erie, Pa.

One of the systems will be furnished for the new steam generator destined for Con Ed's Astoria Station, and the other is for the Arthur Kill Station. Nerve centers of each system are individual Selective Sequence control boards which supervise the soot-blowing medium through long retractable soot blowers and wall deslaggers.

The radiant-heat type steam generators, being built by Babcock & Wilcox Co, will have a capacity of 2,400,000 lb per hr with a superheater outlet pressure of 2,150 psig and superheat of 1,050 F with reheat of 1,000 F. They are designed to be fired by pulverized coal, oil or gas.

(More M&M on page 104)



DELTA-STAR Announces NEW High Voltage MKV-40 Interrupter Switch

Provides positive current interruption for load and capacitor switching.

The new Delta-Star MKV-40 Interrupter Switch is especially well suited for switching capacitive loads. A series of vacuum switches having extremely high dielectric strength does the job. Ratings 34.5 kv to 138 kv are now available.

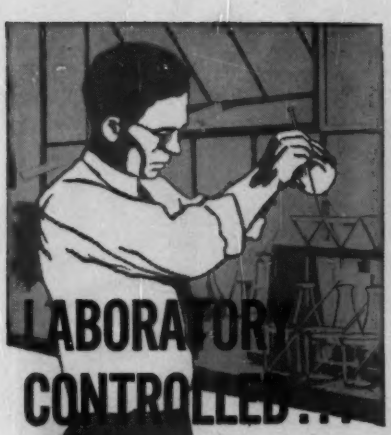
Vacuum switches are in the circuit only during the interrupting cycle. Interruption occurs at first current zero with no restrikes. Jennings vacuum switches used in this device require no maintenance.

Get all the facts about this new Delta-Star switch from your nearest representative. Or, write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton St., Chicago 12, Ill. Offices in principal cities.*

HKP DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.

Divisions of H. K. Porter Company, Inc. are: Alloy Metal Wire, Conners Steel, Delta-Star Electric, Henry Disston, Laclede-Christy, Loschen Wire Rope, McLain Fire Brick, Quaker Pioneer Rubber, Quaker Rubber, Riverside Metal, Vulcan Crucible Steel, W-S Fittings.



Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

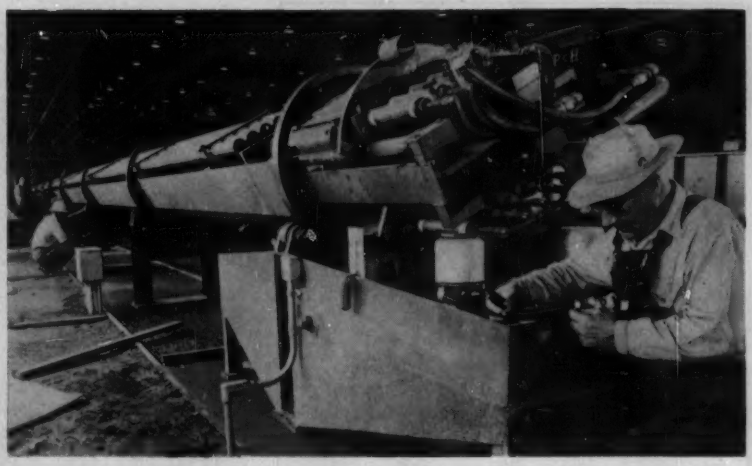
The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana



Draw Bench Readied by American Brass

On the 36,000-lb quintuple-die copper tube draw bench illustrated, workmen are making installation adjustments. This machine will be operated in the $15 million mill of American Brass Co, Paramount, Calif. Of latest design, this draw bench will produce reportedly five tubes at a time, each 125 ft long. Tube drawing will be an important part of the operations of the company's new Los Angeles Division.

The copper and brass mill is expected to be in partial production this autumn, and in full production the first quarter of 1958. Finished facility will have 330,000 sq ft of floor area. Annual capacity is estimated at 30 million lb of copper and copper base alloys in the form of tube, sheet, strip, rod, wire and drawn products. American Brass is a subsidiary of Anaconda Co.

GE Builds Transformer of 375,000 Kva Rating

A power transformer, rated 375,000 kva is being built by General Electric Co at Pittsfield and is scheduled to be shipped next year to a midwest utility.

The unit is the highest-rated ever ordered from GE, according to C. T. Kastner, manager of marketing for the Power Transformer Dept. It will weigh 1.5 lb per kva. Dimensions will be—26 ft long, 12 ft wide, and 15 ft high without bushings. Weight will be about 275 tons. The transformer will be shipped upright in a one-piece tank.

Curtis Plans Lighting Book

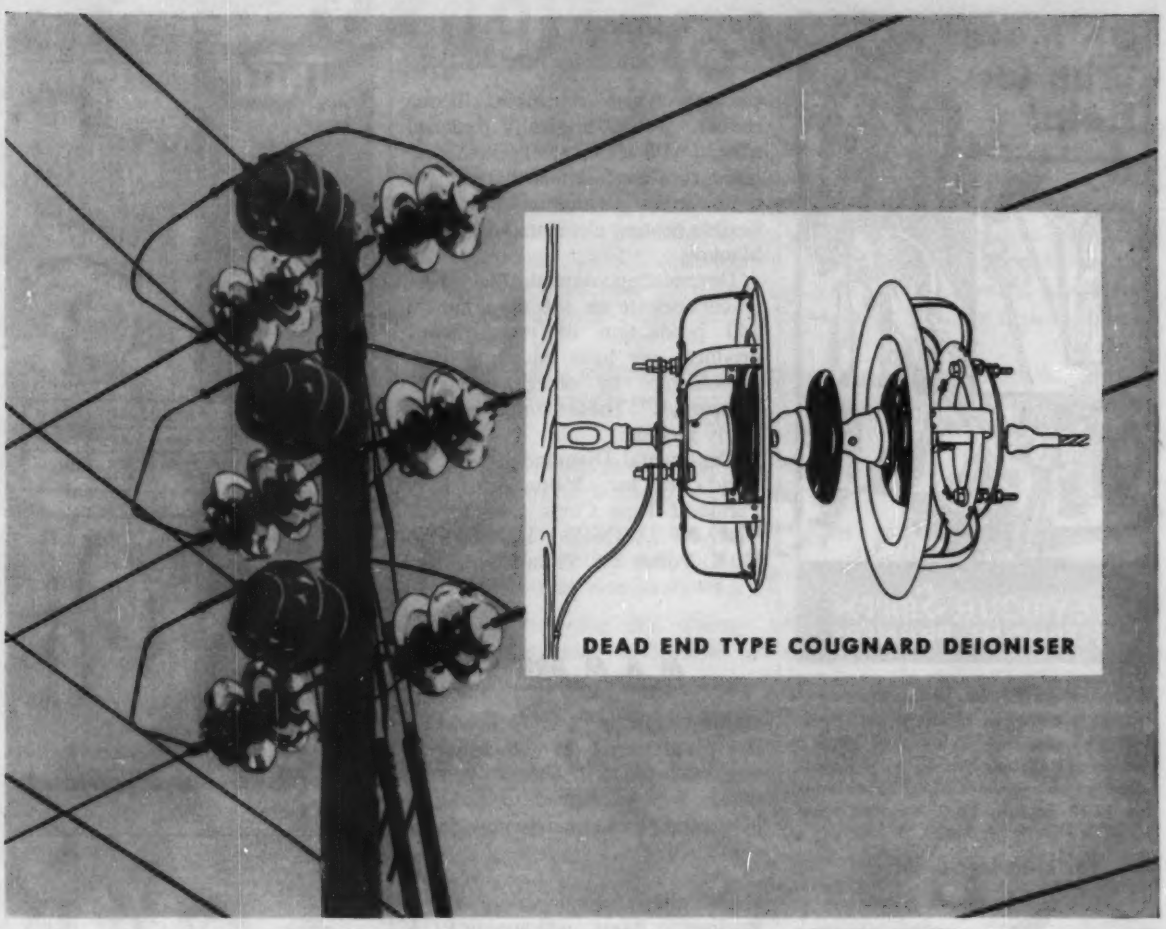
To mark its 60th anniversary this year, Curtis Lighting, Inc, Chicago, plans to issue a book on latest trends and accepted standards in commercial and institutional lighting. The book, to have approximately 250 pages, is the third to be published by the company since Curtis began operations in 1897. J. L. Stair, a consulting lighting engineer and former chief engineer for the company, has been commissioned to prepare the book.

Dow Corning Discontinues Sale of Silastic Tape, Cloth

After developing, introducing and raising a product to profitable maturity, Dow Corning Corp, Midland, Mich., is giving it up. "It's too popular," is the reason, according to C. A. Doremire, manager, Electrical Sales.

The product is Silastic Type R and RG tape and cloth, a glass cloth

(*Continued on page* 106)



Announcing the availability in the United States of the

COUGNARD DEIONISER

—a revolutionary device designed to protect high voltage electric installations against high-frequency atmospheric discharges

The Cougnard Deioniser has been used for years in Europe and Africa with full success. Recent installations in the United States and in Canada have been equally outstanding.

The Cougnard Deioniser is designed for the protection of circuits from 15 KV to 230 KV.

For complete engineering data and full information, write:
Electric Service Works
Delta-Star Electric Division
H. K. Porter Company, Inc.,
Philadelphia 32, Pa.

HKP

ELECTRIC SERVICE WORKS
DELTA-STAR ELECTRIC DIVISION
H. K. PORTER COMPANY

Divisions of H. K. Porter Company, Inc. are: Connors Steel, Delta-Star Electric, Henry Disston, Lochedo-Christy, Leschen Wire Rope, McLain Fire Brick, Quaker Rubber, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings.

Illustrated above is No. 11 Tree Pruner with center cut action by tempered steel blade that easily handles 1" branches. Head is reinforced malleable iron. Spruce poles with telescoping aluminum joints. For heavier work No. 12-18, capacity 1½". Also Pole Saws.

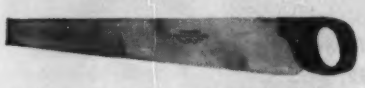
for clearing brush...

SEYMOUR SMITH

TIFFANY PRUNERS

Hand forged throughout. Fast and easy double cut action with thin blades shaped to "draw in." Improved bolt and nut joint, through handle and riveted grip fastening.

FAST-CUTTING SAWS



Blades of Swedish charcoal steel. Large, deep teeth with heavy set to prevent binding. Hand and Pole models for all work up to chain sawing.

Quality Tools
SEYMOUR SMITH
Since 1905

Send for FREE literature

Seymour Smith & Son, Inc.
2405 Main St.,
Oakville, Conn.

Dow Corning

(Continued from page 104)

coated with semi-vulcanized silicone rubber. It was originally designed for use as a resilient, high-temperature cure-in-place insulation for motor coils. Other uses include flexible heating elements and curing blankets.

Doremire continued, "In order to concentrate on the development and production of raw silicone products, we have encouraged its manufacture by other competent companies." These companies currently include:

Continental Diamond Fibre Div, Budd Co, Inc, Valparaiso, Ind.; Permacel Tape Corp, New Brunswick, N. J.; Quaker Rubber Div, H. K. Porter Co, Philadelphia, Pa.

M & M BRIEFS

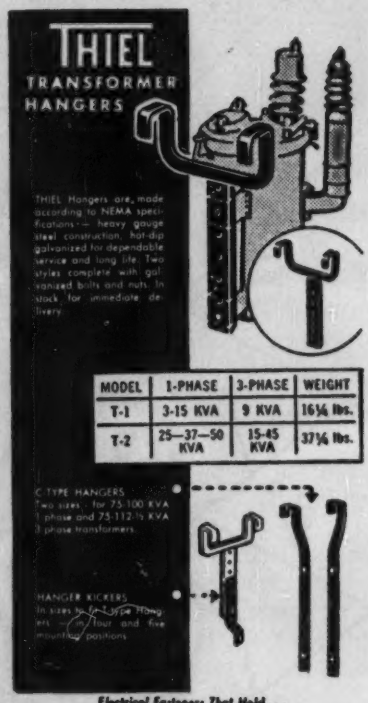
Cutler-Hammer, Inc, Milwaukee, has plans to set up a distribution warehouse in Pittsburgh. Present offices will be moved to a warehouse and office structure now under construction.

High-Voltage Engineering Corp, Burlington, Mass., will supply RCA Laboratories, Princeton, N. J., with a one-million-volt Van de Graaff generator to study radiation damage in various electronically active materials.

Graybar Electric Co has started moving into a new subbranch at Rutland, Vt., where a 10,000-sq ft building area has been leased for stock and service.

Russell Mfg Co has glass insulating tapes in eight colors—black, orange, blue, yellow, red, green, brown, and white—to simplify assembly and maintenance. The company is located at 252 East Main St, Middletown, Conn.

General Switch Co, Brooklyn, N. Y., has installed electroplating equipment. Using this process, pullout type fusible service entrance equipment will have electroplated terminal connectors which accept No. 6 and larger conductors of aluminum or copper.


THIEL
TRANSFORMER
HANGERS
THIEL Hangers are, made according to NEMA specifications — heavy gauge steel construction, hot-dip galvanized for dependable service and long life. Two styles complete with galvanized bolts and nuts. In stock for immediate delivery.
MODEL | 1-PHASE | 3-PHASE | WEIGHT
T-1 | 3-15 KVA | 9 KVA | 16¼ lbs.
T-2 | 25—37—50 KVA | 15-45 KVA | 37¼ lbs.
C-TYPE HANGERS
Two sizes - for 75-100 KVA 1 phase and 75-112½ KVA 3 phase transformers.
HANGER KICKERS
In sizes to fit C-type Hangers — four and five mounting positions

Electrical Fasteners That Hold...

THIEL TOOL & ENGINEERING CO. INC.

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Men on the Move

Now available
in a *new edition...*
with *new figures.*

This popular booklet points up the important sales problem of personnel turnover in industry. Out of every 1,000 key men (over a 12-month period) 343 new faces appear . . . 65 change titles . . . 157 shift . . . and 435 stay put. These figures are based on average mailing address changes on a list of over a million paid subscribers to McGraw-Hill magazines.

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ELECTRICAL BUSINESS OUTLOOK

Electrical World
MAY 6, 1957

A long straight line—that's the shape of the industrial production curve this year. And it confounds business skeptics who say production must move with basic industries like housing, autos, and steel. True, auto production is running about as it did last year. But steel output for the first three months is roughly 300,000 tons under 1956. And March housing starts dropped below the 900,000 rate compared with 1.1 million last year. Yet, industrial production has held steady through March at 146 on Federal Reserve Board's index.

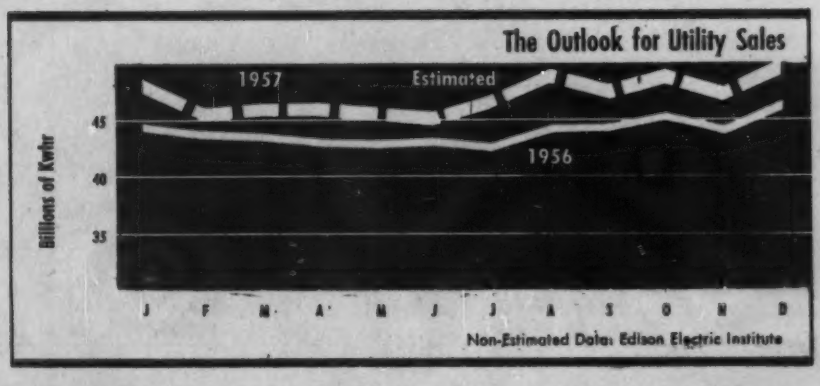
The production curve will probably go right on charting a straight line for the next several months even if steel, autos, and housing do not reverse their trends. Here's why:

- Business investment in new plant and equipment, as we reported last week (EW, p 89) will run 12% ahead of last year.
- New orders for machinery are holding up well and already point to a continuing high level of output well into next year. The McGraw-Hill new orders index for the first three months shows a 7% gain over 1956.
- Business during the first quarter adopted a cautious attitude toward inventory accumulation. Inventories are now about in line with sales, and there may be some pick-up in the rate of accumulation in the next quarter.
- The consumer's well-stuffed pocketbook is one of the brightest omens. Personal income rose at the annual rate of $3.3 billion in the first quarter. Steady improvement in employment indicates continuation of the trend.

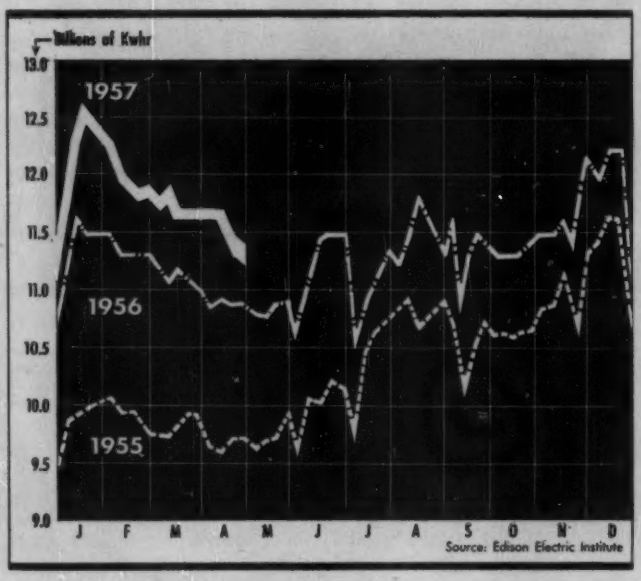
Coming rounds of wage hikes may not boost prices as much as you'd expect. This is the gist of answers to a question on commodity price outlook for the rest of 1957, which National Association of Purchasing Agents asked members.

Labor costs will be higher, NAPA members agreed. The entire increase of wage boosts can't be offset by improved methods. But competition will prevent manufacturers from passing on all their increased costs. 58% anticipating prices to inch upward, 36% say "remain the same," and only 6% believe they'll be lower.

Continuing squeeze on corporate profits, however, may bring price revisions, regardless of coming wage contract negotiations. The big three—General Electric, Westinghouse, and Allis-Chalmers—have referred to the squeeze, either by statement or implication, in their annual reports to stockholders. The 11% hike on Westinghouse dry type transformers last month is a case in point.



STATISTICS



OUTPUT

Week ended April 27,
11,315,000,000 Kwhr
Up 4.1%

Per Cent Change From Previous Year

	Apr. 13	Apr. 20	Apr. 27
Total U. S.	+7.1	+ 5.4	+ 4.1
New Eng.	+5.2	+ 1.1	+ 0.6
Mid. Atlan.	+4.7	+ 1.6	0.0
Cent. Ind.	+6.7	+ 3.0	+ 1.4
West Cent.	+9.5	+ 7.1	+ 3.4
Southeast	+7.4	+ 5.4	+ 5.8
South Cent.	+9.5	+11.9	+12.3
Rocky Mount.	+7.2	+ 8.8	+ 7.0
Pacific			
NW	+9.5	+10.9	+11.1
SW	+7.8	+10.9	+ 4.1

Seasonally Adjusted Index 223.5
Week Ago 227.7
Year Ago 215.0

Atomic Energy Commission requirements—1,150,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 4.3%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Feb.	121.33	121.20	115.59	5.0
Peak—Class 1 Systems. } million kw	Feb.	98.8	103.8	94.2	4.9
Estimated Dec. '57 Peak	Jan.	113.7	114.5	113.3	0.4
Production—billion kwhr	Feb.	48.67	55.50	47.99	1.4
Hydro		9.98	10.19	10.63	− 6.1
Fuel		38.69	45.31	37.36	3.6
Sales—billion kwhr	Jan.	49.15	47.46	46.32	6.1
Residential		14.44	13.22	13.45	7.4
Commercial		7.54	7.34	7.00	7.7
Industrial		24.68	24.44	23.60	4.6
Other		2.49	2.47	2.27	9.7
Fuel Consumption	Feb.				
Coal—million tons		13.21	15.98	13.44	− 1.7
Oil—million barrels		6.96	9.90	7.10	− 2.0
Gas—million cu ft		83.24	74.77	67.81	22.8
Net Income Class A & B Co's—million	Jan.	123.86	132.82	126.58	2.1
Residential Customers—millions	12 mos.	45.81	45.71	44.50	2.9
Revenue per kwhr	ended	2.59¢	2.60¢	2.64¢	− 1.9
Avg kwhr per customer	Jan. 31	2,985	2,969	2,778	7.5
Avg annual bill		$77.31	$77.19	$73.34	5.4

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Mar.	148	147	143	3.5
ENR Construction Cost	April	148.7	148.6	143.2	3.8
BLS Cost-of-living	Mar.	118.9	118.7	114.7	3.7
New Orders for Machinery (1950 = 100)	Feb.	158	152	161	− 1.9
NEMA Sales					
Insulation materials	Feb.	146	154	163	−10.4
Electric appliances		94	96	109	−13.8
Wholesale prices	Feb.				
Motors and generators		140.2	140.2	126.6	10.7
Transformers and regulators		146.6	146.6	131.2	11.7
Switchgear and fuses		164.4	164.4	147.5	11.5
GNP—annual rate—$ billion	4th Qtr.	423.8	413.8	397.3	6.7

MANAGEMENT BULLETIN

FINANCE

Electric utilities were again selling new securities in the market last week. Blyth & Co group sold quickly 300,000 common shares of Portland General Electric Co at $25 a share. Company has placed with institutions $10 million first mtg 4⅞% bonds due 1987 at 99.60% . . . Morgan, Stanley & Co group offered $25 million sinking fund 4⅜% debentures due 1987 of the British Columbia Power Commission at 98% to yield 4.50%. Issue reported "going well."

Duquesne Light Co common stock owned by Standard G&E will be distributed. Standard Gas & Electric Co has announced that holders of its common stock will receive on May 15 one share of Duquesne Light common for each four shares held of Standard Gas common. This move was taken "in further compliance with the Public Utility Holding Co Act of 1935."

New financing for electric companies continues heavy. These utilities are planning to sell bonds: Public Service Co of Colorado, $30 million; Central Maine Power Co, $18 million; Florida Power & Light Co, $15 million; and Tacoma, Wash., Public Utility Board, $5 million. These will sell preferred stock: Public Service Electric & Gas Co, 250,000 shares of $100 par; Savannah Electric & Power Co, 20,000 shares of $100 par stock to nine institutions; and Southern California Edison Co, not more than 1.2 million shares. Common stock will be sold by these companies: Gulf States Utilities Co, 200,000 shares; Public Service Co of New Mexico, 181,997 shares; Florida Power Corp, 255,813 shares, and Savannah Electric Power Co, 163,334 shares.

Stock splits are becoming popular. Arkansas-Missouri Power Co is planning a 3-for-2 stock split. . . . Virginia Electric & Power Co is making a 2-for-1 stock split.

Plans bi-monthly billing. Kansas City Power & Light Co has asked the Missouri Public Service Commission approval to bill its customers on a bi-monthly basis instead of monthly. It is also making a similar request to Kansas Corporation Commission.

EEI reports electric utility security offerings. For the first quarter of 1957 these utilities offered $792.1 million in new securities to the public as compared with $247.1 million for the like quarter of 1956, Edison Electric Institute has announced.

EMPLOYEE RELATIONS

Tuition refund plan set up by Duke Power Co. To help regular full-time employees, who wish to further their education, company refunds 75% of tuition and registration fee paid for approved courses of instruction. Employees must submit a certificate of satisfactory completion to receive the refund.

"Now For That JOB." This is the title of an ad that is running in college magazines this month by the Public Service Electric & Gas Co. For the senior the ad says "We hope that you have given consideration to applying for an engineering career at PSE&G . . ." And as for you juniors, the ad says, during the summer months you can give a lot of thought to where you want to work after your graduation. Public Service provides excellent Cadet Training Courses.

CONSTRUCTION

Electric companies continue to announce expansion plans. American Gas & Electric System will spend close to $750 million for capital facilities in the five-year period 1957-60. This is an increase of $50 million over anticipated expenditure for this period when the program was announced only a year ago . . . West Penn Power Co expects to spend $61 million in 1957-1958 period . . . El Paso Electric Co will build new $12-million, 80,000-kw plant on 145 acres of land off Newman Road . . . Holyoke, Mass., Water Power Co will build

$30-million, 137,500-kw steam plant . . . Maine Public Service Co plans to begin construction late this year on an 11-mi, $350,000 section of a 17-mi international transmission tie line to the New Brunswick Electric Power Commission. Balance of the line from the Canadian border will be built by the commission . . . Tucson Gas, Electric Light & Power Co plans to spend $12 million in 1957 . . . Utah Power & Light Co buys a 100-acre tract for a steam plant and a corridor for three transmission lines. Corridor, a 200-acre expanse of and with a maximum width of 200 ft, links the steam plant site with a substation under construction near Midvale.

RATES

Niagara Mohawk Power Corp asks for $8.6 million a year rate hike. New schedules filed with PSC will adjust rates for 60-cycle service. Residential customers will pay $3.8 million more a year and commercial and industrial, $4.8 million. Company has pending before the PSC a new schedule for 25-cycle service which was filed on Dec. 28, 1956. This schedule affects 525 industrial and commercial customers and represents about $1.3 million a year. In addition 25 large industrial customers at Niagara Falls will be served under the new schedules which have been effective under an existing schedule since June 7, 1956, when Schoellkopf hydro plant was destroyed. On the basis of power taken by these industries before June 7, increase represents about $5.8 million annually.

Two other electric companies ask for rate increases. The first is Louisville Gas & Electric which is requesting approval to boost electric rates by $2,165,000 a year. The other is Montana-Dakota Utilities which is filing applications with North Dakota and Montana Public Service Commissions to raise rates for residential and commercial customers. Company is planning similar increase about July 1 in South Dakota where rates are not regulated. Increase in the three states will be $1,124,000 a year before taxes.

LEGISLATION

A bill which will permit North Carolina electric utility companies to build pipelines to transport coal to their generating plants has been introduced in the legislature. Measure will give companies the right of eminent domain across property between the generating plants and the coal supplier. The public service commission is backing the bill.

California legislature rejects bill to require public utilities selling gas or electricity to pay property taxes. Assembly committee on revenue and taxation votes a study of the proposal for a report to the 1959 session of the state legislature. Representatives of Los Angeles Department of Water & Power, East Bay Municipal Utility District, and Sacramento Municipal Utility District opposed the legislation. They contended that one governmental agency to levy a compulsory tax against another is unsound in principle.

Nebraska legislature has a bill which would authorize publicly owned utilities to contribute to non-sectarian charities and pay employee membership dues in nonprofit civic organizations.

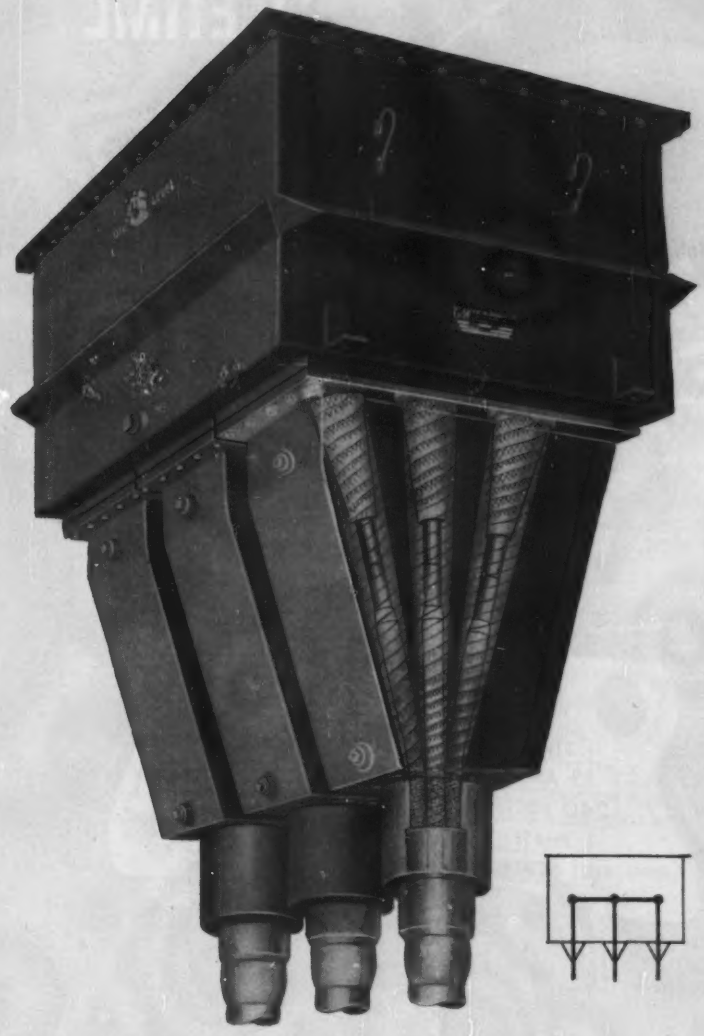
Utility relocation bill. Gov George Docking vetoed a Kansas legislative bill which would have required the State Highway Commission to pay the cost of moving utility facilities from highway rights-of-way on construction projects.

PUBLIC RELATIONS

New printed format for "Public Power News." A mimeographed newsletter, published in recent years by the Washington PUD Assn of Seattle, will appear in a printed format beginning with the May issue, according to Ken Billington, executive secretary of the association. Circulation will be expanded to include PUD employees, Billington said, with member PUDs having arranged to pay for the subscriptions of their employees.

Don't splice those 34500 volt cables!

Make your 3 way interconnections with G&W TYPE "OL" OIL FILLED LINK BOXES



Type "OL" oil filled box, 3-way, 3 pole, 34.5 Kv., 500 Mcm. Stud bushing cableheads, gas filled for three conductor low pressure gas filled cables. The cable conductors are press connected in the streamlined sleeves attached to the copper studs. Tape insulation is extended up over the tapered porcelains and the insulated joint is fully shielded.

Eliminate troublesome 3-way cable joints. Provide distribution system flexibility at a low cost. Use Type "OL" boxes for interconnecting cables that may require non-load break disconnection* or GROUNDING—Use them for "stop joint" connection of different kinds of cables—Use them for breaking up cable circuits into sections to reduce internal pressures due to differences in elevation.

Type "OL" boxes are welded steel, relatively small in size because of lower clearances required for oil immersed live parts. Cables are terminated in potheads, hermetically sealed; compound, oil or gas filled—or in stud bushing cableheads, as illustrated.

Type "OL" boxes are made for any voltage or size of cable. They meet AIEE basic insulation levels.

***Type "RA" oil switches are available for load break disconnection at 34.5 Kv.**

Bulletin BB55 lists various types of cable boxes for voltages up to 15,000. Type "OL" boxes for higher than 15Kv. are usually special, but often with standard pothead parts.

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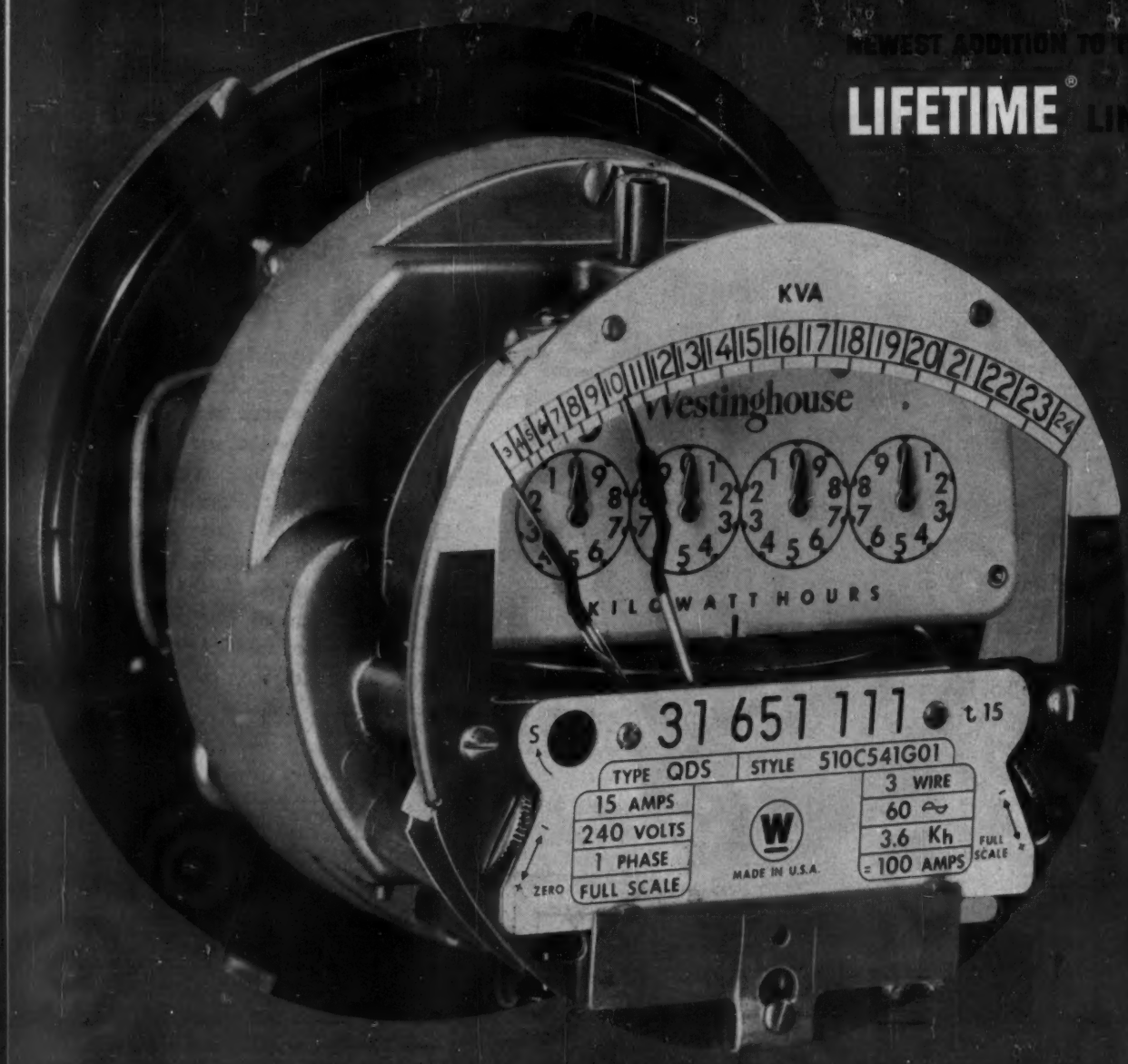

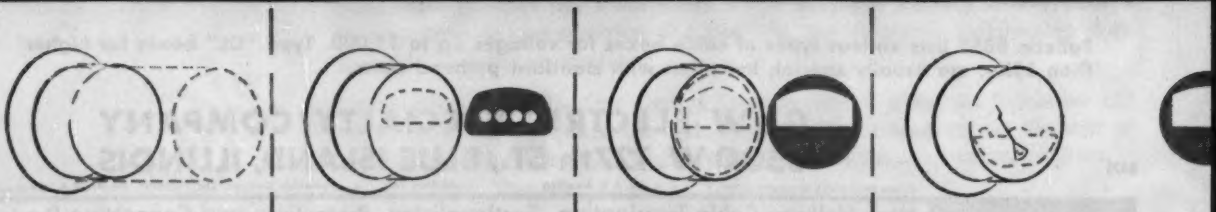

MORE COMPACT—Designed for residential use where there is broad application of low-power-factor appliances. Westinghouse QDS is the smallest thermal demand meter obtainable.

MORE EASILY SERVICED—The standard DS/DA watthour register may be removed for required checking or resetting without disturbing the demand element.

COMPLETE THERMAL UNIT and plate assembly is bayonet mounted—may be removed by loosening only two screws—without disturbing watthour portion.

BLACK POINTER (peak demand indicator) may be reached for checking or replacing silicone lubricant by removing front plate only. Remove only four screws.

NEW, COMPACT, SINGLE-PHASE THERMAL DEMAND METERS

The QDS is a thermal-type ampere demand meter—designed to give you the least possible maintenance—and the closest parallel to heat index of distribution equipment under high-ampere, low-power-factor demand. It is calibrated to show kva demand, which prevents registration losses due to low-power-factor loads. The thermal unit is self-contained, completely sealed, bayonet mounted (with the plate assembly) to the watthour portion. Heater is "wrap-around" type, Chromel Resistance Ribbon. Bi-metal sensors are Midflex 46—stability-proved over years of service. The watthour portion is the performance-proved, 15-ampere (100-ampere extended range) DS meter. Further details and features are outlined on the facing page. A companion model, DSH, is available for kilowatt demand indication.

J-40494

Complete information is available through your Westinghouse sales representative—or meter sales engineer. And there is a sample ready for your complete inspection.

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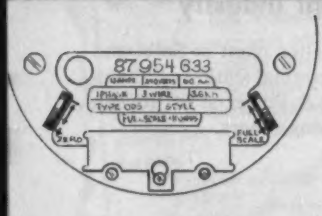
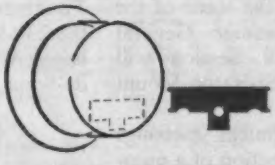
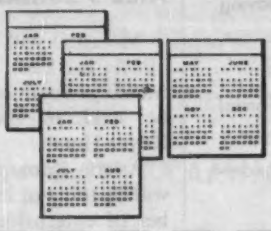
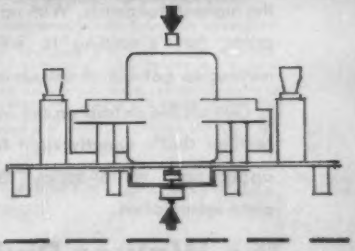
Westinghouse









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SIMPLE "BADGE" MOUNTING— The Electric Utility identification "badge" or nameplate is provided for with a keyhole slot, single screw mounting on the lower faceplate. Attaching or removing is simple.

SAME TEST SCHEDULE— The same schedule of testing and checking calibration which applies to single-phase DS and DA watthour meters applies to the QDS and the DSH.

BEARINGS FRONT AND REAR— Demand pointers turn on a shaft with silicone lubricated bearing in front and a permanently lubricated bearing at the rear.

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The Walker Division
Norma-Hoffmann Bearings Corporation
STAMFORD, CONNECTICUT

Manufacturer-Utility Reciprocity Is Essential

(Continued from page 61)

consideration to the effect of step starters.

Step starter experience indicates that they cannot be properly policed. On one occasion a serviceman, apparently because of some difficulty, bypassed a step starter. This fact was not known to the dealer for whom the serviceman worked, to the customer, or to the utility. Such an instance suggests that eventually most step starters will be put out of use by servicemen.

Single-phase step starters present a serious cost situation. It is not unusual for various air-cooled residential air conditioners to be installed at customer prices of $900 to $1,400 over and above the cost of the heating system. A standard starter, supplied by several major control people and UL approved for safe operation, commonly costs the customer $150 to $200.

No major manufacturer produces a unit without UL approval, as it would be impossible to sell equipment without it. But the laboratories do not sanction installation of starters on air conditioners in the field, even when both starters and air conditioners have approval. To add the starter, a unit's internal wiring must be disturbed. Thus for approval of the whole package, each manufacturer would be compelled to build a starter in every air conditioner. According to their manufacturers' quotations, a major increase in the volume of starters would not bring down their price appreciably.

English Sintering Plant to Make Fly Ash Product

Sintering plant on the site of the Battersea Power Station of the Central Electricity Authority of England is expected to handle 100,000 tons of fly ash.

Recently completed, the sintering plant will use the fly ash for the production of "Terlite". It is claimed that this product is an ideal replacement material for natural heavy aggregates for: poured-in-place concrete, refractory concrete, and guniting applications.

The sintering plant consist of several large kilns and a huge concrete storage bunker. The sintering installation is connected to the power plant by two 8 in. pipes. When the kilns are fully operating these pipes will funnel an average flow of 250 tons of fly ash daily. The concrete bunker can hold a reserve of 1,000 tons.

The price at the plant for a cu yd of "Terlite" is $3.85.

The 100-ft high sintering plant covers an area of about 5,000 sq ft and cost about $700,000. However, duplication of equipment within this first plant raised the cost. It is estimated that a sintering plant of this type can be advantageously installed at any power plant which provides at least 150 tons of fly ash daily.

AIEE's Summer Meeting to See Montreal Industry

Montreal will be the scene of the 1957 A.I.E.E. Summer General Meeting, June 24-28. Sessions will be held in the Sheraton-Mount Royal Hotel.

Apart from technical meetings will be tours of inspection of a number of enterprises in Montreal and vicinity, and a visit to the Bersimis power development by 44 delegates.

Visits will be made also to Hydro-Quebec's Beauharnois power plant, its Bout de l'Ile Substation and Service Center, Quebec Iron and Titanium smelter plant in Sorel and the 230-kv terminal station of Shawinigan Water & Power at St. Joseph de Sorel, among others.

Good Load Builder

The 216,000-hp propulsion wind tunnel at the Arnold Engineering Development Center at Tullahoma, Tenn., is being operated only during "off peak" hours.

Are you in generation? Transmission? Distribution? System operations?

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Get the COMPLETE picture of utility equipment and practices you need to win better-paying jobs

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In straightforward language, this library gives you the practical facts, ideas, and methods most electric utilities use to solve their operating problems sucessfully.

Expert engineers in the field carefully explain every step in electric generation. They show you the workings of entire steam, hydro, and diesel stations as well as gas-turbine stations . . . answer all your questions about transmission and distribution systems . . . show you how to handle each of the operations involved in scheduling and maintaining equipment to produce electric power economically and efficiently.

Everything you need to understand the utility as a whole is covered—hundreds and hundreds of working facts and methods on such topics as . . . boiler control . . . equipment scheduling . . . load dispatching . . . rate schedules . . . how circuit breakers and generators are controlled . . how internal combustion engines and gas turbines work . . . how fuel is selected and transported to the boiler furnace.

Experienced utility men planned this Library especially for spare time training. They take nothing for granted—start you right from scratch. Simple arithmetic is the only math used. Any man aiming for a technical utility job or advancement will find it smoother going with this thorough, helpful tool.

Helps you do better work in such jobs as:

Lineman	Dispatcher
Repairman	Maintenance mechanic
Service man	Engineering assistant
Installer	Record tracer
Technical clerk	
Operator	

and many others

Technicians Needed!

"We hear much about the demand for engineers. One obvious remedy is to increase the number of well-trained engineering technicians. Many times we find engineers doing jobs that could be performed as well, at least in part, by technicians. The best figures now available call for at least five engineering technicians to each professional engineer on the engineering team. Our current situation is almost the reverse — four engineering graduates to each technician. This doesn't mean we need fewer engineers. Rather, it means the engineers will need more coworkers."

From an editorial in POWER

THE McGRAW-HILL

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Edited by BERNHARDT G. A. SKROTZKI

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STEAM STATIONS

Describes in simple terms the basic principles of the steam-electric generating stations. You get the facts on selecting fuel, design and operation of steam generators and fuel-burning equipment, piping, turbines, condensers, treatment of feedwater and cooling water. Explains how electric generators work and are cooled—including instrument and automatic control systems—auxiliary systems, and super-pressure steam stations.

Electric Transmission and Distribution

Gives you a sound idea of actual layout of equipment used in transmitting and distributing electric energy —from generating station to customer's connection. Clearly explains overhead and underground circuits, capacitors, transformers, auxiliaries, street lighting, means of protection, etc. Packed with specific facts on such matters as methods of eliminating lamp flicker, conditions that fix current carrying capacity of cable, restarting network after shutdown, maintenance of circuit breakers, etc.

Electric Generation
HYDRO, DIESEL, AND GAS TURBINE STATIONS

Deals with central stations other than steam-electric, describing their fundamentals, their distinctive equipment and operations, and their part in the whole electric supply system. You see how various types of hydraulic turbines and gas turbines work, how they are arranged and controlled. Operation, arrangements, and control of internal combustion engines are made plain, along with switching equipment, transformers, voltage regulators, etc.

Electric System Operation

Shows you how equipment is scheduled for operation, how it is maintained, and how energy may be interchanged between systems with resulting savings. You get a detailed picture of how relays work, how equipment is put in and taken out of service, how utility system load curves are used, communications between system personnel. Gives you basic principles of incremental rates, shows how rates are calculated, how different forms are used to charge for service, etc.

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IP&L Elects Five to New Offices

FITZWATER

PRITCHARD

Indianapolis Power & Light Co has announced the election of Ottis T. Fitzwater as president of the utility. His promotion follows the retirement from the presidency of Harry T. Pritchard, who will continue his active association with IP&L as chairman of the board of directors, the post to which he has just been re-elected.

At the same time, Bernard W. Schotters was elected to the new position of executive vice president, Edwin L. Cassady was named vice president and treasurer; and Ralph W. Husted rose to secretary and counsel.

Fitzwater has spent his entire business career in the electric service of Indianapolis. Starting as a timekeeper in 1923 at an IP&L predecessor, he rose to accounting department clerk, assistant treasurer, and treasurer, and was named vice president and treasurer in 1949.

Pritchard, president nearly 23 years, has been in the utility field since his 1908 graduation from Yale University. He was a vice president of IP&L when it started operation in 1927.

Schotters, vice president and secretary since 1952, has a 31-year record with IP&L. During this time he has also been assistant purchasing agent, member of the IP&L legal department, assistant secretary, and secretary.

Cassady, a 28-year IP&L veteran, has been assistant treasurer since 1945 and previously was supervisor of property records. He is a past president of National Assn of Cost Accountants.

Husted, assistant secretary since 1941, joined the company's legal department in 1940. He formerly was engaged in private law practice.

SCHOTTERS

CASSADY

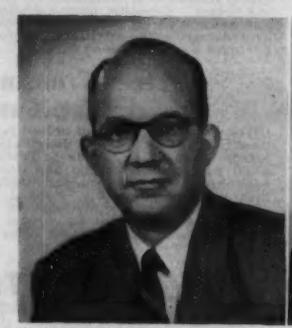
HUSTED

Toledo Edison Advances Davis and Marshall

John K. Davis has been elevated from vice president and assistant general manager of Toledo Edison Co to executive vice president and assistant general manager. W. A. Marshall, secretary and treasurer, was elected vice president and secretary of the utility.

Davis joined Toledo Edison in 1946 as director of personnel. Three years later he was named vice president and a director of the company. The post of assistant general manager was added to his responsibilities in April, 1955, and in July of that same year he became executive head of sales. Before 1946 he was with East Tennessee Light & Power Co, where he was division superintendent and division manager.

Marshall joined the investigation department staff of Toledo Railway & Light Co, Edison's predecessor, after doing post graduate work at St. Louis University. He was named assistant secretary in 1927 and secretary in 1947. In 1949 the duties of treasurer were added to his responsibilities.



DAVIS

MARSHALL

In simultaneous promotions, Roger B. Williams was named treasurer and assistant secretary and W. B. Moran was advanced to the position of controller and assistant treasurer.

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Dayton P&L Names Three to VP Positions

Concurrent with the realignment of executive responsibilities, Dayton Power & Light Co has advanced Kenneth G. Oxley, Edward J. Rommel, and Josiah V. Colley to vice presidents.

Oxley, as vice president and manager of all electric operations, will have responsibility for electric operations of the Dayton, Northern, Southern, and Western Divisions, as well as transportation, purchasing, and stores, and claims, leases, and rights-of-way divisions. Since 1940, when he joined DP&L, he has also been project engineer and assistant to manager of electric operations.

Rommel, who becomes vice president and manager of the commercial division, has been manager of the division for two years. Before joining DP&L in 1950 as an administrator of power sales and rural sales, he was with Toledo Edison for 21 years as an engineer in substation design, underground operation, and industrial lighting.

OXLEY ROMMEL COLLEY

Colley, now vice president, treasurer, and assistant secretary, has held the latter two positions since 1952. He was formerly comptroller. Aside from the period from 1939 to 1945, when he was with Columbia Gas & Electric Corp, he has been associated with DP&L since 1922.

In other new appointments, Lawrence J. Renas was named manager of Dayton electric operations; Edwin D. Smith manager of public and industrial relations; and Herman Coulter manager of industrial relations.

Chiles and Brown Become Westinghouse VP's

CHILES

Newly elected vice presidents of Westinghouse Electric Corp are John H. Chiles, Jr, manager of the transformer Division at Sharon, Pa., and B. M. Brown, manager of the Baltimore, Md., Divisions.

Chiles, whose entire 31-year career has been spent at the firm's transformer division, became manager of the large operation last year. His previous positions there include engineer in charge of the instrument transformer section, division engineer in charge of instrument and regulator activities, and division engineering manager.

Brown has been in Baltimore since 1953 when he was named manager of the airport plant there. Since joining Westinghouse in 1931 he has been also manager of the industrial department's petroleum and chemical section.

BROWN

PERSONAL BRIEFS

Mississippi Power & Light Co has named **D. C. Lutken** as superintendent of its newly established production department. He is succeeded as Delta steam plant superintendent by **C. L. McKaskel. E. P. Swain** is new Natchez plant superintendent, and **B. A. Dudding, Jr,** becomes results engineer of Delta.

William A. Galbraith, former state director of the Washington department of conservation and development, is a new special assistant to **Dr William A. Pearl,** Bonneville Power administrator.

At Philadelphia Electric Co, the Electrical Engineering Division has assigned the following posts in the new station design, station equipment, and field engineering sections: Station design—**F. W. Myers,** engineer in charge; **E. E. Brown,** assistant engineer in charge; **W. S. Einwechter,** supervisor, substation branch. Station equipment—**Daniel Leitch,** engineer in charge; **H. R. Paxon,** assistant engineer in charge; **G. W. McKenna,** supervisor, apparatus branch. Field engineering—**W. E. Scholz,** engineer in charge; and **J. B. Gallagher, H. R. Gallen,** and **T. C. Sickles,** supervisors of area branches.

(More Personal Briefs on page 122)

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MEETINGS CALENDAR

MAY

Pennsylvania Electric Association—Communications Committee, Hotel St. Francis, Canton, Ohio, May 6-7; Eighth Annual Customer Relations Conference, Hotel Hershey, Hershey, Pa., May 8; Electrical Equipment Committee, Hotel Roosevelt, Pittsburgh, Pa., May 9-10; Relay Committee, Bedford Springs Hotel, Bedford Springs, Pa., May 16-17; Systems Operation Committee, Skytop Lodge, Skytop, Pa., May 23-24.

Edison Electric Institute—Prime Movers Committee, Tides Hotel, St. Petersburg, Fla., May 6-8; Commercial Cooking and Water Heating Committee, Sheraton Hotel, Chicago, Ill., May 7; Hydraulic Power Committee, Highland Hotel, Massena, New York, May 13-15; Industrial Relations Committee, EEI Headquarters, New York City, May 16; Electrical System and Equipment Committee, Statler Hotel, Buffalo, N. Y., May 20-21.

Northwest Electric Light & Power Association—Business Development Section, Vancouver, B. C., May 6-8.

• **American Institute of Electrical Engineers**—East Central and Middle Eastern District Meeting, Dayton-Biltmore Hotel, Dayton, Ohio, May 7; Eighth Annual Appliance Technical Conference, Rackham Bldg., Detroit, Mich., May 20-21.

Appliance Parts Jobbers Association, Inc—18th Annual Meeting, Balmoral Hotel, Miami Beach, Fla., May 7-11.

Electric Companies Advertising Program—Copy Group Meeting, Hotel Statler, Cleveland, Ohio, May 8.

Public Utilities Advertising Association—Annual Convention, Hotel Statler, Cleveland, Ohio, May 8-10.

Georgia Institute of Technology—Protective Relaying Conference, sponsored jointly with American Institute of Electrical Engineers, Hightower Auditorium, Atlanta, Ga., May 9-10.

Southeastern Electric Exchange—Heat Pump Steering Committee, sponsored jointly with Association of Edison Illuminating Companies and Edison Electric Institute, Battle House, Mobile, Ala., May 10-11.

Industrial Nuclear Technology Conference—Museum of Science and Industry, Chicago, Ill., May 14-16.

Pacific Coast Electrical Association—Annual Convention, Fairmont Hotel, San Francisco, Calif., May 15-17.

New York State Society of Professional Engineers—1957 Engineering Industries Exposition in connection with its annual convention, Statler Hotel, New York City, May 16-18.

• **National Electrical Manufacturers Association**—Dry Process Electrical Porcelain Section Meeting, Hotel Cleveland, Cleveland, Ohio, May 17.

American Institute of Mining, Metallurgical and Petroleum Engineers—Eleventh Annual New England Regional Conference, Hotel Statler, Boston, Mass., May 17-18.

American Public Power Association—Lake Placid Club, Lake Placid, N. Y., May 21-23.

National Association of Electrical Distributors—49th Annual Convention, Sheraton Park and Shoreham Hotels, Washington, D. C., May 26-29.

JUNE

Electric Companies Advertising Program—Management Group, Palmer House, Chicago, Ill., June 2.

Electric Companies Public Information Program—Steering Committee, Palmer House, Chicago, Ill., June 2.

Eighth Annual Conference on Industrial Research—Sponsored by the Department of Industrial and Management Engineering of Columbia University, Arden House, Harriman, N. Y., June 2-7.

• **American Management Association**—General Management Conference, Statler Hotel, New York, N. Y., June 3-5.

American Society of Refrigerating Engineers—53rd Annual Meeting, Hotel Fontainbleau, Miami Beach, Fla., June 3-5.

Edison Electric Institute—Annual Convention, Palmer House, Chicago, Ill., June 3-5.

National District Heating Association—48th Annual Meeting, The Homestead, Hot Springs, Va., June 3-6.

Electric Association—Chicago Electrical Industry Show, Conrad Hilton Hotel, June 4-6.

American Institute of Electrical Engineers—Industrial Power Rectifiers and Semiconductor-Metallic Rectifiers Committees, Morrison Hotel, Chicago, Ill., June 4-5; Summer General Meeting, Sheraton Mount Royal Hotel, Montreal, Quebec, June 24-28.

American Society of Mechanical Engineers—Semiannual Meeting, Sheraton-Palace Hotel, San Francisco, Calif., June 9-13.

Public Utilities Association of the Virginias—Accident Prevention Conference, Daniel Boone Hotel, Charleston, W. Va., June 14.

American Society for Testing Materials—Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 16-21.

Industrial Management Center — Fourth Annual Material Handling Training Conference, Lake Placid, N. Y., June 16-29.

Canadian Electric Association — Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 19-21.

American Society for Engineering Education—Annual Meeting, Cornell University, Ithaca, N. Y., June 17-21.

Wisconsin Utilities Association—Annual Convention, Accounting Section, Kings Gateway Hotel, Land o' Lakes, Wisconsin, June 23-25.

Michigan Electric Association—Grand Hotel, Mackinac Island, Mich., June 23-26.

American Society of Heating and Air Conditioning Engineers—Semi-annual Meeting, Manoir Richelieu, Murray Bay, Quebec, June 24-26.

AUGUST

• **American Institute of Electrical Engineers**—Pacific General Meeting, Yakima, Washington, Aug. 26-30.

SEPTEMBER

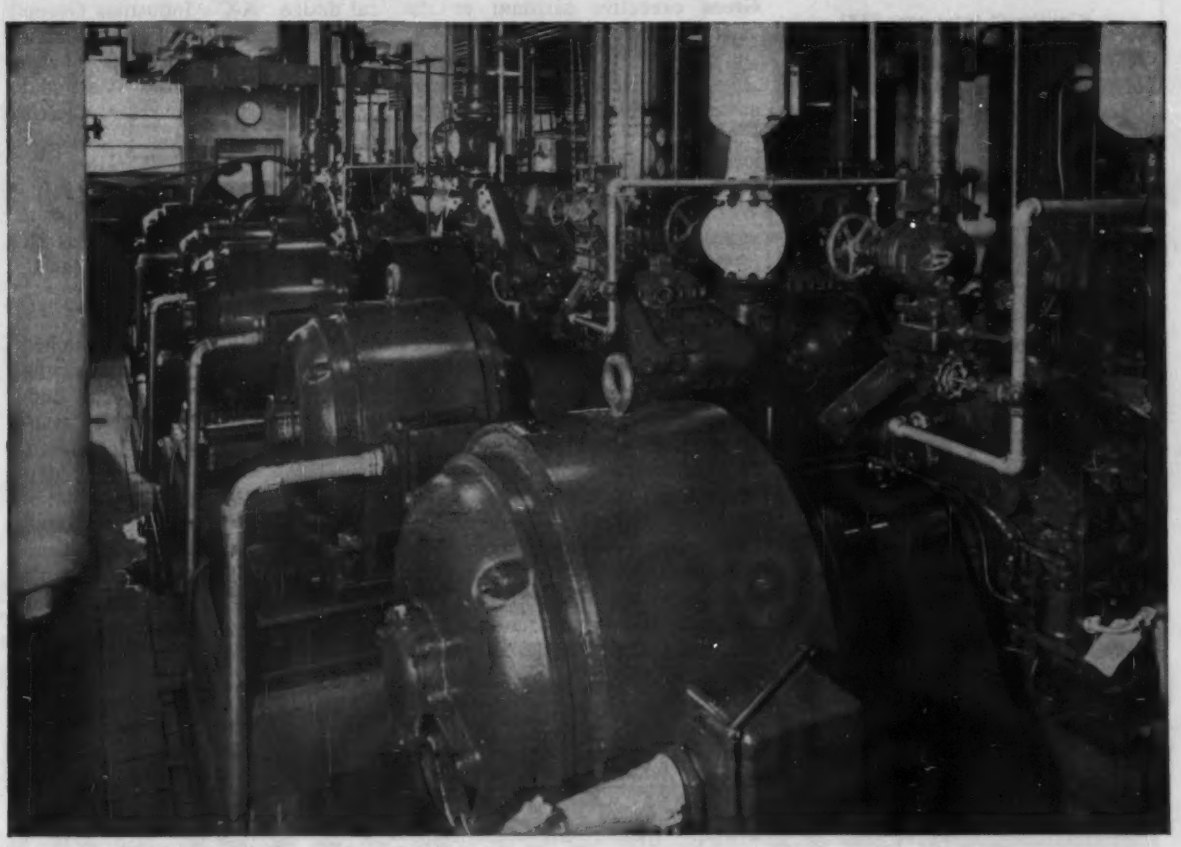
• **Illuminating Engineering Society**—National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

• **Edison Electric Institute**—Accounting Division Organization Meeting, jointly with AGA, Lemington Hotel, Minneapolis, Minn., Sept. 19-20; Industrial Relations 10th Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 23-25, Meter & Service Committee, Hotel Nicolett, Minneapolis, Sept. 24-26.

• Additions this week.

R/W Meeting Slated for Electric Companies

The first national gathering of electric company right-of-way men is scheduled for May 15 at Chicago, Ill. Problems and practices in acquiring sites and rights of way will be discussed at the one-day session. The meeting will be held in the Conrad Hilton Hotel. For details write R/W Editor, Electrical World, 330 West 42nd St., New York 36, N. Y.



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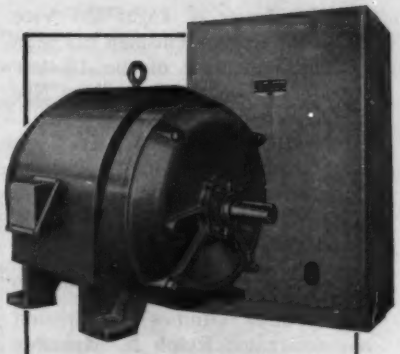

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Personal Briefs

(Continued from page 118)

Roger H. Williams is new manager of industrial development in the sales department of Jersey Central Power & Light Co and New Jersey Power & Light Co . . . Public Service Electric & Gas Co has named **Howard A. Watt** to head the recently established claim department.

Worcester County Electric Co has appointed **John T. Costello** to direct operations in Webster, Southbridge, Spencer, and Palmer.

A. H. Wade was recently appointed assistant to **J. F. Pennington,** vice president of operations of Georgia Power Co, and **R. J. Cooper** has been named assistant operating manager to succeed Wade. New superintendent of the utility's Plant McManus is **John F. Porch.**

Oklahoma Public Service Co's **J. R. Misenheimer** has been advanced to the new post of results analysis engineer. **A. W. Groenewold** replaces him as chief engineer, Tulsa station.

California Oregon Power Co has named **Andrew H. Schmidt** rural extension engineer . . . **George T. Loss** is new safety director of Public Utility District No. 1 of Snohomish County, Wash.

Florida Power & Light Co Vice President **George Kinsman** has been elected a member of the 16-state Regional Advisory Council on Nuclear Energy.

Recently appointed to the Indiana Public Service Commission were **John W. VanNess,** chairman; and **Garland Skelton** and **Ira L. Haymaker.**

Ohio Public Utilities Commission has designated **Ralph N. Mahaffey** as chief attorney examiner . . . **J. C. Wilson** is new member of the Arizona Power Authority.

New general sales manager for Calgary Power, Ltd, Alberta, is **D. A. Hansen** . . . B. C. Electric Co's **Henry Whitefield Smith** has been appointed assistant general manager of B. C. Engineering, a subsidiary. The parent firm also named **W. Fraser Miles** assistant chief engineer-operations and **G. F. Green** executive assistant to the chief engineer.

Roy E. Fountain is new engineer-advanced value research in General Electric Co's manufacturing services component.

Westinghouse Electric Corp has advanced **John F. Moyer** to manager of dealer promotions in the major appliance advertising department.

Allis-Chalmers Manufacturing Co's steam turbine department has named **W. F. Dueringer** assistant to the manager of the department; **D. J. Nairn** manager of product sales; **J. M. Crawford** sales manager of units larger than 50 Mw; **F. E. White** sales manager of units 50 Mw and smaller and marine propulsion equipment; **W. R. Murley** manager of renewal parts and customer service; **E. P. Hansen** assistant chief engineer; and **Cecil H. Morris** engineer in charge of steam turbine mechanical design. A-C's Industries Group has advanced **L. H. Walke** to manager, utility sales; **E. E. Ellis** to manager, general industries sales; and **John H. Baisley** to manager, metals industry sales.

Malleable Iron Fittings Co has appointed **Ogden W. Sutro** director of sales and marketing and **Gustaf R. Young** director of manufacturing operations.

Howard J. Mullin has been named assistant vice president-sales distribution of U. S. Steel Corp. Succeeding him as district sales manager in New York is **J. M. Curto.**

Burdette A. Johnson, comptroller of New England Gas & Electric Assn's Service Corp, and **Thomas Chambers,** comptroller of British Columbia Electric Co, Ltd, have been elected national directors of the Controllers Institute of America.

READERS FORUM

Shippingport All-Civilian

To the Editor:

We read with interest the article in the March 18 issue regarding the 100-Mw hydrogen cooled generator for the Shippingport nuclear power plant.

The article states that the generator will be used in the world's first atomic power station used exclusively for civilian needs. You will be interested to know that Calder Hall power station in Great Britain has now been in operation for approximately 6 months and is the first atomic power station of its kind in the world.

We would be pleased to know whether this was an error on the writer's part or whether the power station mentioned in the article is being used exclusively for civilian needs.

G. J. Hodges
Power Apparatus Specialist
Northern Electric Co, Ltd
Sudbury, Ontario, Canada

• Shippingport nuclear power plant is scheduled for operation in late 1957 and will be used exclusively for the generation of electric power. The Calder Hall reactors are primarily production reactors (used to produce weapons-grade plutonium, like the AEC's Hanford reactors) and in addition convert the heat generated in the reactors to electrical energy.

Author Corrects Error

To the Editor:

I wish to call to your attention a typographical error that appeared in an article in the Feb. 18 issue entitled, "Net Send-Out Analysis Is Valuable."

Figure 1 of this article indicates a boiler capacity of 100 units for three (3) types of boiler feed pump schemes. This in incorrect. The capacity for the bottom two (2) schemes should be 103. This is quite important and can lead to misunderstandings of the basic thinking in the comparison.

R. F. Scheibel
Mechanical Engineer
Sargent & Lundy
Chicago, Ill.

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Subject to Prior Sale

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Central Illinois Public Service Co.
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3—100 KVA Wagner—2400/4160—13.2
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3—G.E. induction regulators—25 KVA, 2400/4160 32 step with 10+10 voltage regulation

All of these transformers are only four or five years old and in excellent condition.

Contact Board of Public Works, Auburn, Nebraska c/o Lambert Blecha, manager.

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U. S. Government

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3	667	Kuhl.	66,000–480
3	200	Pitts.	66,000–2300
3	1500	Wag.	44,000–6900/11950
3	75	West.	44,000–7200/12470Y
3	5000	G.E.	38100/66000–6600
4	3125	Mcl.	39900/66000Y–26600/46000Y
3	3333	G.E.	33000/11000–2400/7200
2	3000	Stand.	33000–4160, 3 Ph.
4	1667	West.	34,500–7200, Inertaire
3	1500	A.C.	34,500–2300
3	667	A.C.	33000–2400/4160Y
4	333	Kuhl.	33000–7200/12470Y
3	200	A.C.	34500–2400/7200/12470Y
3	75	Wag.	33000–240/480
1	2000	A.C.	23,380–2500/4330Y, 3 Ph.
3	2000	A.C.	26,400/13,200–2390/4140
3	1000	G.E.	23,310–2500/7500/12990Y
3	100	G.E.	22,000–7200/12470Y
3	50	G.E.	22,000–2300
3	1667	G.E.	13,800–600
1	1000	West.	13,200–2300, 3 Ph. Unit Sub.
1	1000	A.C.	13,800–480, 3 Ph.
1	600	Stand.	13,200–2300, 3 Ph.
1	450	Penna.	13,200–2400, 3 Ph. Askarel
3	200	G.E.	13,200–2400
3	50	West.	13,800–125/250
1	2500	A.C.	11,000–2400/4160Y, 3 Ph.
3	125	A.C.	6600–2300
3	500	West.	2400/4160Y–240/480
3	150	West.	2400–230/115
1	100	G.E.	2300–575, 3 Ph.
6	50	West.	2400–114/228, Dry Type
3	25	G.E.	480–120/240

FEEDER REGULATORS—Outdoor

1	500	West.	167 A. 34500 V. 3 Ph. STEP
1	250	A.C.	601 A. 2400 V. 3 Ph. STEP
3	96	G.E.	200/400 A. 2400 V.1 Ph.IND.
6	36	West.	150/300 A. 2400 V.1 Ph.IND.

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Advertising in This Issue

Advertising Council, Inc..... 126
Allis-Chalmers Mfg. Co...4th Cover
8, 9, 37, 95
American Brass Co.....88, 89
Anaconda Wire & Cable Co...12, 13
Anchor Mfg. Co..... 90

Baxter & Co., J. H..... 36
Blackburn Corp., Jasper..... 82

Cavalier Corp. 77
Chapman Chemical Co..... 81
Chase & Sons, Inc..... 117
Clark Controller Co., The..... 15
Coates Electric Mfg. Co..... 94
Copperweld Steel Co..... 34

Delta-Star Electric Division, H. K. Porter Company, Inc.... 103
Directory of Engineers..... 123
Dow Corning Corp..... 91

Electric Service Works, Delta-Star Division, H. K. Porter Company, Inc. 105
Engineers, Directory of..... 123
Enjay Company, Inc..... 75
Esterline-Angus Co., Inc., The.. 98

G & W Electric Specialty Co..... 111
General Electric Co.
Apparatus Dept. .....2nd Cover
68, 69, 71, 72, 73
Graybar Electric Co., Inc..... 7
Grinnell Co., Inc..... 6

I-T-E Circuit Breaker Co.
Switchgear Div. 30, 31
Indiana Steel & Wire Co., Inc... 104
Ingalls Iron Works Co., The..... 26
Irwin Auger Bit Co..... 80

Kearney Corp., James R.....92, 93
Kuhlman Electric Co..... 38

Lapp Insulator Co., Inc..... 14
Line Material Co..... 23

McGraw-Hill Book Co., Inc..... 115
Minneapolis-Honeywell Regulator Co. Industrial Div..... 119
Moloney Electric Co.....3rd Cover

Natvar Corporation 86
Nelson Electric Mfg. Co..... 96

Ohio Brass Co.....39, 40, 41, 42
Okonite Co., The..... 4
Orangeburg Mfg. Co., Inc..... 10

Pennsylvania Transformer Co... 33

R T & E Corp..... 27
Roebling's Sons Corp., John A... 32
Ross Heat Exchanger Div.
American-Standard 78, 79

S & C Electric Co..... 18
Sangamo Electric Co..... 97
Searchlight Section 123, 124
Smith & Son, Inc., Seymour..... 106
Southern States Equipment Corp. 35

Thiel Tool & Engineering Co., Inc. 106

Wagner Electric Corp..... 121
Walker Div. Norma-Hoffmann Bearings Corp. 114
Warn Mfg. Co..... 98
Westinghouse Electric Corp..... 11
16, 17, 24, 25, 84, 85
100, 101, 112, 113
Willys Motors Inc..... 99
Worthington Corporation 28, 29

■

PROFESSIONAL SERVICES..... 123

■

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F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES.123, 124

EQUIPMENT
(Used or Surplus New)
For Sale 124

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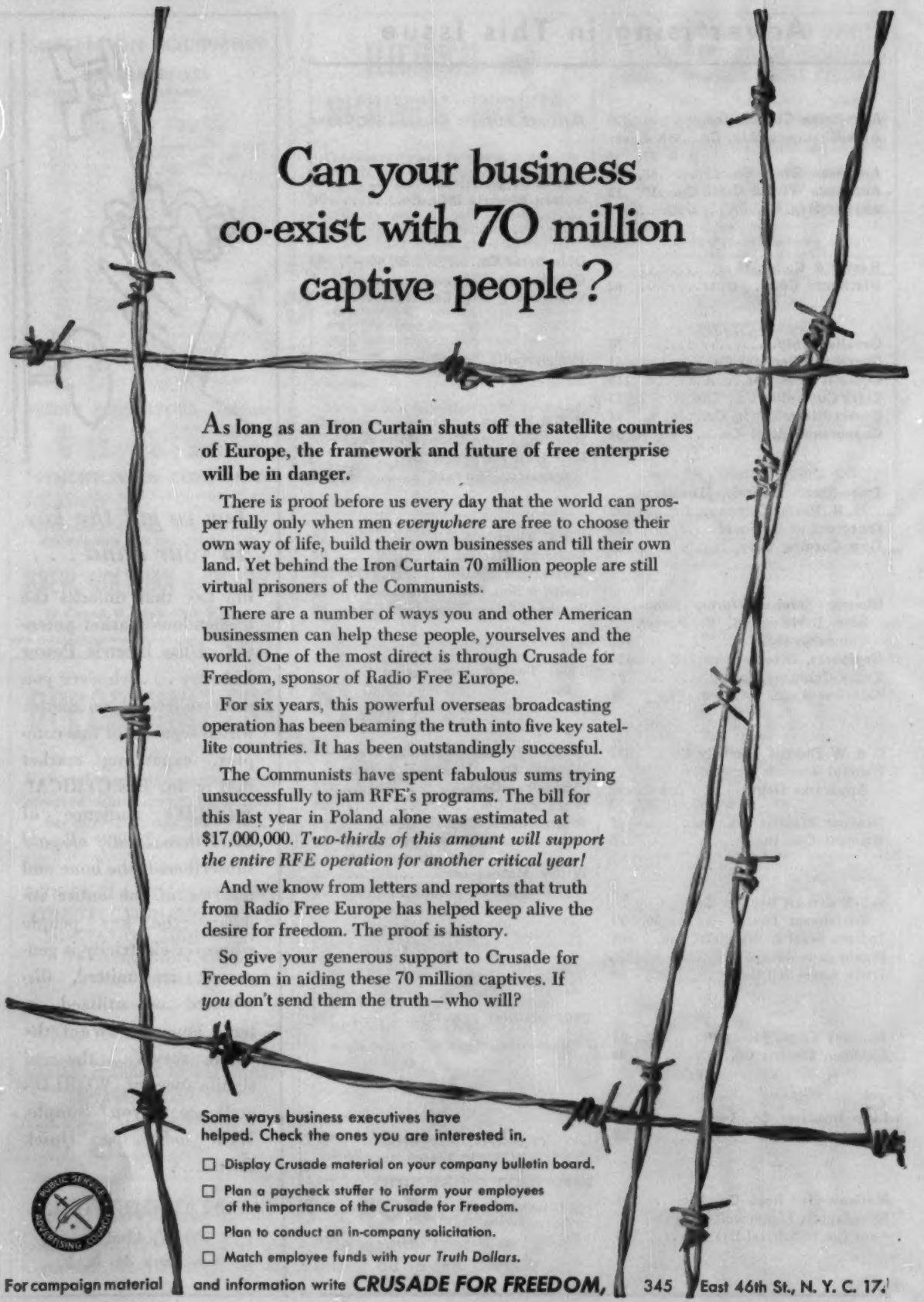
Can your business co-exist with 70 million captive people?



As long as an Iron Curtain shuts off the satellite countries of Europe, the framework and future of free enterprise will be in danger.

There is proof before us every day that the world can prosper fully only when men *everywhere* are free to choose their own way of life, build their own businesses and till their own land. Yet behind the Iron Curtain 70 million people are still virtual prisoners of the Communists.

There are a number of ways you and other American businessmen can help these people, yourselves and the world. One of the most direct is through Crusade for Freedom, sponsor of Radio Free Europe.

For six years, this powerful overseas broadcasting operation has been beaming the truth into five key satellite countries. It has been outstandingly successful.

The Communists have spent fabulous sums trying unsuccessfully to jam RFE's programs. The bill for this last year in Poland alone was estimated at $17,000,000. *Two-thirds of this amount will support the entire RFE operation for another critical year!*

And we know from letters and reports that truth from Radio Free Europe has helped keep alive the desire for freedom. The proof is history.

So give your generous support to Crusade for Freedom in aiding these 70 million captives. If *you* don't send them the truth—who will?

Some ways business executives have helped. Check the ones you are interested in.

- ☐ Display Crusade material on your company bulletin board.
- ☐ Plan a paycheck stuffer to inform your employees of the importance of the Crusade for Freedom.
- ☐ Plan to conduct an in-company solicitation.
- ☐ Match employee funds with your *Truth Dollars*.

PUBLIC SERVICE ADVERTISING COUNCIL

For campaign material and information write *CRUSADE FOR FREEDOM*, 345 East 46th St., N. Y. C. 17.

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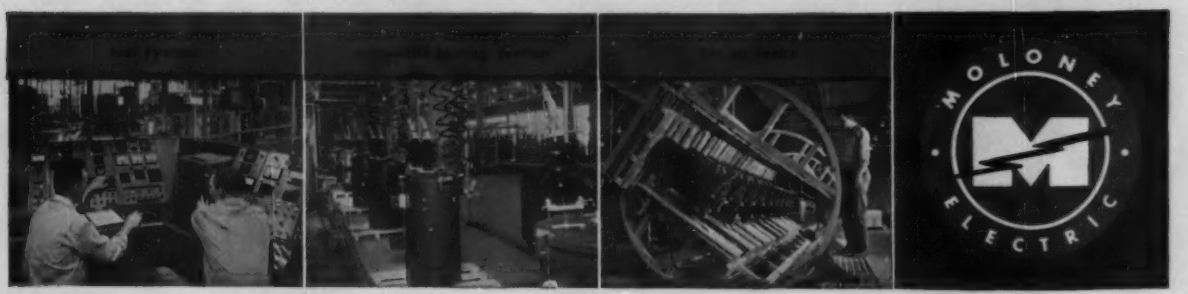

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Visible for hundreds of feet, the *Thermalite* indicator can be checked from a service truck. Overloaded transformers are singled out without the expense of a complete survey. Replacement or other system changes may be made at your convenience.

Greater Utilization Possible

You can stretch transformer dollars by taking advantage of the inherent overload capabilities of distribution transformers on your system. *Thermalite* indicators let you use this capability without endangering service continuity.

Low-cost *Thermalite* indicators are available on Allis-Chalmers distribution transformers 167 kva and smaller, 15 kv and below. For complete information, contact your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wis.

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